

Cerebral Meningitis.

By Martin W. Barr, M. D.,

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CEREBRAL MENINGITIS

ITS HISTORY, DIAGNOSIS, PROGNO-
SIS, AND TREATMENT.

BY

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1892.

GEORGE S. DAVIS,
DETROIT, MICH.

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1892.



TO

J. M. B.,

Who, from the purity and nobility of his life, has taught me

THE TRUE MEANING OF THE LATIN WORD

VIR,

I HUMBLY DEDICATE

Whatever is worthy in this little book, as a small tribute of
my love and admiration.

PREFACE.

I have essayed to present in as succinct a manner as possible the various forms of meningitis, together with the general history of the disease and its treatment. To this end I have carefully selected the views of the best known writers on the subject, adding to these my own observations from practical experience.

There has been comparatively little written on cerebral meningitis, and my search has been most discouraging.

I have endeavored to note in every case the source from which I acquired my knowledge.

I wish to express my warmest thanks to Dr. Billings, of the U. S. Army; Prof. Wm. Pepper and Prof. John Guit  ras, of the University of Pennsylvania; Dr. Isaac N. Kerlin, of Elwyn, Pa.; and Dr. J. M. Malatesta, of Philadelphia, Pa., for facilitating my work. I am deeply indebted to Miss Sarauw, of Denmark, for her extremely clever translations, and also to Miss Hjorth, of Norway.

Last, but not least, I gratefully acknowledge the assistance of my co-worker, Dr. Alfred W. Wilmarth, who has placed his notes, both clinical and post-mortem, at my disposal.

In conclusion, I would thank a number of my friends—whose names it is not necessary to mention—for their kind and loving interest in my work.

MARTIN W. BARR.

Pennsylvania Training School for Feeble-Minded Children,
ELWYN, PA., December 1st, 1891.



CEREBRAL MENINGITIS.

ITS HISTORY, DIAGNOSIS, PROGNOSIS, AND
TREATMENT.

SCHEMA.

In my classification of *meningitis*, I have departed somewhat from the conventional paths and stereotyped nomenclature of the various forms of this disease.

My reasons for so doing are: *First*, because I think the numerous subdivisions, now extant, are bewildering and incomprehensible alike to student and practitioner. *Second*, because many of the recognized forms are simply exaggerated or modified symptoms of the primary malady.

It is often extremely difficult, and frequently impossible, to make a positive differential diagnosis between the various classes of cerebral meningitis.

It may not be out of place for me to mention here that I have never in all my experience met with what might be called "*a typical case.*" In a number of cases coming under my observation—where, although the symptoms were very obscure, the diagnosis of meningitis was made—I have verified it at the post-mortem examination.

I have annexed several cases of unusual interest

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to this article. In one or two I have written out the symptoms and treatment very minutely. Although they are analogous in the main, each presents some marked difference or distinctive peculiarity.

I touch but superficially on *pachymeningitis* and the treatment of the *tubercular* variety. The former because it comes more properly within the sphere of the surgeon; the latter because the discoveries made by Koch, have opened a new era in the treatment of this disease.

I should like to call especial attention to the fact that, with a single exception (Case 2), the fifty-one patients from whom I made my clinical notes and collected my data were mentally defective, and for this reason peculiarly liable to cerebral trouble.

I have adopted the classification of Dr. Kerlin in describing the intellectual condition of my patients:

- | | | |
|---------------------|---|-----------------------|
| 1. IDIOCY. | { | (a) <i>Apathetic.</i> |
| | | (b) <i>Excitable.</i> |
| 2. IDIO-IMBECILITY. | | |
| 3. IMBECILITY. | { | (a) High grade. |
| | | (b) Middle grade. |
| | | (c) Low grade. |
| 4. MORAL IMBECILE. | | |

DEFINITION AND REMARKS.

Cerebral meningitis (μηνγίτις, a membrane, and *itis*, inflammation,) is the general term applied to inflammation of the internal and external enveloping

membranes of the brain—the pia mater, and the dura mater. The arachnoid, (*ἀράχνη, εἶδος, like a spider's web,*) or intermediate membrane, owing to its extreme delicacy and peculiar construction, is never the seat of inflammation. It is a serous membrane composed entirely of white, fibrous, and elastic tissues, utterly devoid of any vascular supply, and even the presence of nerves is doubtful.* M. Rosenthal † recognizes inflammation of the arachnoid, but states that it is invariably complicated by meningitis, and it is impossible to distinguish the two diseases, clinically. He further says that the post-mortem examination frequently reveals a thickening and the presence of false membrane or osseous plates upon the arachnoid, with firm adherence to the dura mater. Opacity and thickening are usually met with in old age.

He reports that in a large number of suicides upon whom autopsies were made in Vienna, hypertrophy of the arachnoid and contiguous meninges was observed. These unfortunates all belonged to the intelligent classes of society, and had been troubled

* Francis Minot describes the parietal arachnoid as a simple pavement epithelium, covering the internal surface of the dura mater, and the visceral arachnoid as forming the external layer of the pia mater. He does not recognize such a disease as arachnitis. Pepper's System of Medicine, Article on Diseases of Membranes of Brain, etc., vol v, p. 703.

† Diseases of Nervous System, p. 13.

at various periods of their life with cerebral congestions, melancholia, delusions, suspicions, and frequently occurring insomnia, which was unamenable to treatment. Obersteiner* found small, disseminated white patches of thickened arachnoidea scattered over the whole convexity after chronic brain disease, especially in idiots.

In the case of an excitable idiot, aged sixteen years, who died of widely diffused meningitis of the convexity, I found a number of opacities scattered through the membranes, to which the arachnoid was closely adherent.

Brown† reports a case of “acute arachnitis.” L. Meyer‡ found epithelial products on the superior surface of the arachnoid, in chronic cases of cerebral irritation.

In some cases the pacchionian bodies are changed into connective-tissue products. This is said to occur also in drunkards, epileptics, and in the insane who are subject to attacks of acute mania.

I have never seen this morbid condition either in epileptics or those who are troubled with mania. We frequently find the arachnoid in infants stained by inhibition from hæmorrhages of the pia mater, or brain.

* The Anatomy of the Central Nervous Organs, p. 385.

† Medical Times and Gazette, London, 1852, N. S. IV, p. 387.

‡ Virchow, Archiv., 17 Bd., p. 209.

Aubanel, Bayle, Calmeil, and Prus regarded these various changes as "pseudo-membranes of the arachnoid."*

Hammond† recognizes inflammation of the arachnoid, but always in connection with inflammation of the pia mater.

As far back as 1858, George B. Wood‡ said that meningitis was seldom, perhaps never, confined to the arachnoid, and he thought that this membrane served no other purpose than to admit the passage of the morbid products through its pores.

Sir Thomas Watson§ says that there *may* be an uncomplicated acute arachnitis, but that it is doubtful whether there can ever be an inflammation of the other two membranes without involvement in greater or less degree of the arachnoid. He further goes on to say: "If simple arachnitis of an acute kind ever happens, it has not been my fortune to see or recognize it; and I can tell you nothing about it. In truth, the authors who use the word arachnitis do not intend thereby to express unmixed inflammation of the arachnoid, but include under that term inflammation of the pia mater also. Some apply the name *meningitis* to that compound affection."

* Mental Diseases, Griesinger, p. 418.

† Diseases of the Nervous System, Wm. A. Hammond, p. 221.

‡ A Treatise on the Practice of Medicine, vol. ii, p. 657.

§ Watson's Practice of Physic; Hartshorne, vol. i, p. 319.

Ambrose Ranney, H. Charlton Bastian, Jonathan Hutchinson, Parent-Duchâtelet, Stillé, and Lallemand, together with many other well known authorities, recognize arachnitis as a distinct disease.

In spite of the opinions of the learned men whom I have just quoted, I am inclined to think that inflammation of the arachnoid is a physiological impossibility. The symptoms said to attend it are found in the various forms of meningitis. In my own experience I have never seen the arachnoid the seat of inflammation. Hence, I adhere to my original statement that inflammatory diseases of the brain are confined to the internal and external membranes alone.

Being pathologically indivisible from the pia mater, they are always considered together in this connection, and inflammation of the pia is called LEPTOMENINGITIS (*λεπτος, thin*, and *μηνιγξ*). When the dura mater is attacked, it is called PACHYMENINGITIS (*παχης, thick*). The inflammation is not infrequently widely diffused, and in many cases it attacks the brain substance itself, causing CEREBRITIS (*καπα, the brain*), in conjunction with the meningitis, or MENINGO-CEREBRITIS.

Cerebral meningitis may be divided and arranged in three principal groups or classes, viz.: Pachymeningitis, simple meningitis, and tubercular meningitis.

Each of these classes undergoes numerous subdivisions, which for convenience I present in tabular form:

PACHYMENINGITIS	{	<i>External</i> pachymeningitis [Acute].
		<i>Internal</i> pachymeningitis [Chronic].
		<i>Hamorrhagic</i> pachymeningitis [Chronic].
SIMPLE MENINGITIS	{	<i>Acute</i> { Basilar meningitis.
		Verticalar meningitis (menin- gitis of the convexity).
		Diffused meningitis.
	{	Meningo-cerebritis.
		<i>Subacute</i> .
	{	<i>Chronic</i> { Basilar meningitis.
		Verticalar meningitis.
		Diffused meningitis.
		Meningo-cerebritis.
TUBERCULAR MENINGITIS	{	<i>Basilar</i> meningitis.
		<i>Verticalar</i> meningitis.
		<i>Diffused</i> meningitis.
		<i>Meningo-cerebritis</i> .

HISTORY.

The early history of meningitis is extremely meagre, and what little is obtainable is involved in much doubt and obscurity.

The ancient Grecian physicians recognized no well-defined difference between the various inflammatory cerebral diseases. They included them all under one head, which disease was known as mania (*μανία*) or frenzy (*φρηνία*). Aretæus regarded all brain troubles as variations of mania.

Hippocrates himself, the great "Father of Medicine," used *φρενίτις* to describe some inflammation of the brain—a febrile delirium—which he maintained was not idiopathic in its origin. Cicero, it may be remembered, severely censured the Greeks

for the inaccurate names which they applied to various things, more especially to medicine and disease.

For hundreds of years physicians unquestioningly followed the teaching of Hippocrates.

Celsus* recognized a disease accompanied by fever, which he called after the Greek *phrenitis*, and described as an aberration or disorder of the brain amounting to "mental insanity." Galen thought that the cerebral inflammations were caused by excess of bile in the system. Boerhaave, Hoffman, and Sauvages attempted to reconcile the proved anatomical facts with the indefinite and uncertain theories of the Greeks, but without success. They taught that the brain disorder was more a keenly felt impression than a definite group of symptoms.

The first well-authenticated history begins with the history of pathological anatomy. Meibomius was the first to discover that the brain substance was not commonly attacked. Morgagni† was the first to recognize and teach that the cerebral membranes were usually the seat of inflammation, and he described with extreme minuteness the various symptoms of meningitis. He it was who also first demonstrated the exudation of gelatin and purulent discharge in the region of the blood-vessels.

* Dictionnaire Encyclopédique des Sciences Médicales, art. "Méningite," vol. vi, p. 633, 2d series, Paris, 1877.

† Lettre 7. par. 6, décrit.

Andral, Rostan, Richter, Bouilland, and Lallemand have elaborated what Morgagni first taught.

Robert Whytt,* in 1768, published a book that was worthy of notice because of the originality of observation and physiological research contained in it.

Quin, in 1780, attempted unsuccessfully to prove that cerebral congestion was the analogue of meningitis.

Galis, Coindet, and Senn asserted most positively that meningitis was confined almost exclusively to the pia mater.

Parent-Duchâtelet and Martinet wrote a work, taking precisely the same ground. They also verified many of the researches and observations made by Whytt.

Lemaire made a number of original observations on inflammation and suppuration resulting from complicated fractures of the cranial bones.

Herpin, who studied under Pinel, in 1803 reported a number of fractures of the cranial bones (that had occurred in *l'armée du Rhin*), where they were followed by symptoms of acute febrile brain disease. He was the one who first made use of the term "*de méningitis ou de méningite*."

In 1814 Fothergill and Biett confirmed the statements made by Parent-Duchâtelet and Martinet. They further classified the disease into "natural hy-

* Hydropsie Aigue des Ventricules du Cerveau.

drocephalus,* hydrocephalus *aigue*,† and meningitis of infants."‡ Basilar meningitis, they affirmed, was caused by the anatomical lesion of tubercular granules.

To Willis§ belongs the honor of being the first to correctly define the inflammation of the cerebral meninges, accompanied by exudation of fluid into the ventricles.

Pons, Oesterlen, and Baillarger|| were among the first to recognize internal pachymeningitis, but Virchow** was the first to fully understand and make public the true nature of the disease.

Although the ancients were dimly cognizant of the existence of the tubercular form of meningitis, no marked distinction between it and the ordinary variety was made until the year 1768, when the brilliant and original brochure by Robert Whytt†† was published after his death by his son; but he had no conception of the pathology of this disease.

In 1815 Gölis discovered that dropsy of the ventricles was not a primary disease, but was caused by inflammation of the meninges or blood-vessels.

* Whytt.

† Fothergill.

‡ Coindet.

§ De Morbis Convulsivis, chap. v, Amastelod, 1862.

|| Rosenthal: Diseases of the Nervous System, p. 9.

** Wuerz. Verh., Bd. vii, 1857.

†† Observations on the Most Frequent Form of the Hydrocephalus Internus, Edinburgh, 1768, p. 725.

Guersant in 1827 named the disease "granular meningitis."

In 1830 Papavoine discovered that the tubercle was an important pathological factor in causing acute hydrocephalus, and that it existed in the cerebral membranes when there was tubercular trouble in other organs.

Three years later Gerhard* reported thirty-two autopsies upon patients who died of this disease. In thirty cases tubercles were found in other parts of the body; in one case there were cavities in the lungs, but no tubercles anywhere except in the meninges. In the remaining case the examination was roughly made and the report was not authentic.

Guersant pursued the study of this disease uninterruptedly, and in 1839 described the differential diagnosis between simple and tubercular meningitis. Barthez† and Rilliet in 1843 verified his teaching.

Dance was the first to observe that meningitis occurred in adults (*op. cit.*).

Ledibroder‡ pointed out the similarity of this disease in adults and children. Valleix noted the same.§

* American Journal of the Medical Sciences, vols. xiii and xiv.

† Pepper's System of Medicine, art. Tubercular Meningitis, Francis Minot, vol. v, p. 724.

‡ Essai sur l'Affection Tuberculeuse Aigue de la Pie Mère, Paris, 1839.

§ Archives Générales de Médecine, 1838.

PACHYMEINGITIS.

SYNONYMS.—*English*: External or internal pachymeningitis; inflammation of the dura mater. *Latin*: Peripachymeningitis; perimeningitis; pachymeningitidis. *French*: Pachyméningite. *German*: Pachymeningitis. *Italian*: Pachimeningite. *Spanish*: Paquimeningitis. *Norwegian*: Fortykkelse af dura mater i cervical afsnittet af rygmarven.

Definition.—Pachymeningitis is an inflammation of the dura mater. It may be acute or chronic, but is usually the latter. It may be either external, internal, or hæmorrhagic.

Internal pachymeningitis is analogous to, and frequently coincident with, the external variety. The ætiology, diagnosis, and treatment are the same, so that one description answers for both, and for convenience we will study them together under the head of pachymeningitis.

Ætiology.—Foremost among the *predisposing causes* of pachymeningitis is sex. Males are more liable to be attacked than females.

According to Bartholow, three-fourths of the cases happen in men. Age is another cause worthy of consideration. The same author says the liability of the disease to occur increases upward from twenty years, and, according to Huguenin, the largest per cent. occurs between seventy and eighty.

The *exciting causes* are many. Most authorities say that this disease is never of idiopathic origin.

Abercrombie,* however, reports several cases of idiopathic pachymeningitis. Fizeau† also believes that it may be a primary disease.

I do not think it possible for this disease to originate without some specific cause, and can find no one to substantiate the observations of Abercrombie and Fizeau.

Traumatic injuries of the cranial bones—contusions, fractures, etc., are frequent causes. Rarefying osteitis, Bright's disease, sclerosis of the liver, cardiac and lung diseases, pernicious anæmia, syphilis, rheumatism, and erysipelas are influential factors in producing this disease.

From the pains-taking and elaborate experiments of Kremiansky‡ and Neumann we learn that pachymeningitis may be artificially induced by chronic alcoholism, resulting from the protracted congestion and coincident expansion of the arteries in the dura mater. The symptoms produced in man and animals are wholly the same.

Thrombosis of the cerebral sinuses, typhoid and typhus fevers, scurvy, otitis media,§ and, according

* Abercrombie on the Brain, p. 21.

† Journal de Médecine, tom., New Series, p. 523.

‡ Ueber die Pachymeningitis Interna Hæmorrhagica, bei Menschen und Hunden, Virch. Archiv., B. xlii, pp. 129-321, 1868.

§ Die Krankheiten des Gehörorganes, von Anton von Trötsch; Gerhard's Handb. der Kinderkrankheiten, Tübingen, 1879, 5 B., ii, Abt., p. 150.

to Kremiansky, recurrent fever, are regarded as causative.

Pathological Anatomy.—Kremiansky says that the disease is usually confined to the vertex, except where it is the result of traumatism.

In acute and less severe cases of external pachymeningitis we find congested spots on the outer side of the dura mater. The membrane itself is much injected and softened, and is overspread with more or less exudation of easily coagulated lymph or pus, or both. In grave cases we find the membrane much ecchymosed and thickened, from new formations of connective tissue. Förster says the membrane is opaque, cartilaginous, anæmic, and frequently pigmented. Osteophytes are occasionally met with.

Sometimes a thickened membrane firmly adherent to the skull is the only visible sign of an attack of pachymeningitis.

Rokitansky * states that in this condition osseous concretions are likely to be found.

Obersteiner † affirms that these bony neoplasms, which are composed of phosphate and carbonate of lime, are more common in men than women. Sometimes they can be detected by merely touching the dura mater.

* Manual of Pathological Anatomy, vol. iii, pp. 324-326.

† The Anatomy of the Central Nervous Organs, pp. 381-382.

But these ossifications may be found in the brains (of old people more especially) of those who have had no brain disease. Frequently the pia and dura mater become so firmly adherent as to be practically one membrane during an attack of pachymeningitis.

Thrombi* often form in the lateral sinuses. Sometimes the brain substance is implicated.

Symptoms.—We have not one single symptom, nor any group of symptoms which are peculiar to this disease.

The most important symptoms are internal cephalalgia, the headache being usually localized over the seat of inflammation. Sometimes severe headache, accompanied by dullness and somnolence, may be the only symptom noticeable, and this condition may continue for an indefinite period.

Lagneau † mentions a case of pachymeningitis whose only symptom was headache, which became more severe at night.

Chills, high temperature, 105° , or even 106° , pulse variable and uncertain, usually about 60 to 80, vertigo, nausea, vomiting, unequal pupils, photophobia, unconsciousness, convulsions, coma, and sometimes paralysis may follow. There may also be coma vigil.

* Diseases of the Membranes of the Brain, etc., Minot. Pepper's System of Medicine, vol. v, p. 705.

† Maladies Syphilitiques du Système Nerveux, Observation, Paris, 1860.

Ramskill* speaks of hyper-sensitiveness of the cornea.

Hamilton† reports congestion of the conjunctiva, and constant lachrymation in some cases.

Diagnosis.—The symptoms of this disease are frequently so very obscure that in many cases a diagnosis cannot be made during life.

Ranney says that the diagnosis of pachymeningitis is more a hypothetical theory than a proved scientific fact.

The ætiology, especially when symptoms of cerebral inflammation follow traumatism, otitis media, or necrosis of the bones of the skull, is our greatest help. Apart from this, we are compelled to diagnose by exclusion.

Prognosis.—The prognosis is grave and uncertain, but not altogether hopeless. Recoveries are said to have taken place, but I think there has never been a perfect cure. Ranney reports a number of recoveries from pachymeningitis when syphilis was the cause. He further states that he has even seen one recovery, when caused by chronic alcoholism, which case he visited with his colleague, Prof. A. L. Loomis.

I can find no other cure on record, save this one, and the question arises as to whether he was positively correct in his diagnosis. How could he verify it beyond doubt?

* Reynolds' System of Medicine, vol. ii, p. 325.

† Nervous Diseases, p. 39.

Cerebral softening, sclerosis, or atrophy are apt to be sequelæ.

Treatment.—It should be borne in mind that any sort of traumatic injury to the head is particularly liable to be followed by pachymeningitis.

The wound should be carefully dressed antiseptically, and inflammation, if possible, prevented. Either corrosive sublimate, carbolic acid, boracic acid, or chlorate of soda (10 or 20 grs. to fl. ʒ j.), make good dressings. This last I have found very efficacious as an antiseptic, its harmlessness making it particularly valuable in large wounds. Trephining may be necessary as a prophylactic measure.

If cerebral irritation be suspected, it is well to place the patient without delay in a cool room from which all light is carefully excluded, and absolute quiet should be enjoined. Cold applications to the head, preferably the ice-bag, or linen cloths dipped in iced water and frequently renewed, are important. The bowels should be kept freely open (calomel, grs. v.), and the bromides and narcotics are very useful, given *ad libitum* when necessary, to quiet the cerebral excitement. If otitis media be the cause of the disease, the ear should be kept carefully cleansed and disinfected.

If indicated, counter-irritants should be applied; leeches over the mastoid region, or to the inside of the nostril. Barthéz and Rilliet recommend that they be placed near the anus or lower extremities. Stimu-

lating applications should be used on the head if inflammation is very marked. Milk should be the main article of diet, and stimulants should not be given at all, or very guardedly.

Through the whole course of the disease I should give iodide of potassium in 10-grain doses, every four hours, night and day.

HÆMORRHAGIC PACHYMEINGITIS.

SYNONYMS.—*English*: Hæmatoma of the dura mater. *Latin*: Pachymeningitis interna hæmorrhagica. *French*: Hématome de la dure mère. *German*: Hirnhautblutungen. *Italian*: Pachimeningite emorragica, or ematoma della dura madre. *Spanish*: Paquimeningitis hemorrágica, or hematoma de la dura-madre. *Norwegian*: Blodninger i rygmarsvshinderne, or betændelse med blodninger i hjernens dura mater.

Definition.—Hæmorrhagic pachymeningitis, or hæmatoma of the dura mater, is a chronic inflammation involving the internal surface of the membrane; followed by the production of numerous strata of vascular tissue (false membranes) among the layers of which hæmorrhages occur. Frequently encapsulated cysts are formed which contain blood or serum.

Ætiology.—Hæmorrhagic pachymeningitis is a disease confined almost exclusively to adults, although

children* are sometimes attacked. Hammond, however, affirms that it is frequently met with in children. According to Huguenin,† it is distinctly a disease of old age.

Minot says that it is unknown among healthy individuals, and in the greater number of cases the blood is disorganized in some way—alcoholism, scurvy, pernicious anæmia, smallpox, pneumonia, rheumatism, Bright's disease, syphilis, etc., being fruitful causes. Atrophy of the brain is another common cause. It is said to be often found among the chronic insane and idiots. I can find many reports of insane patients being so attacked, but not one of an idiot, nor have I ever seen such a case. It is more common among males than females.

Durand-Fardel says that 77.4 per cent. of those attacked are men, 22.6 women.

Pathological Anatomy.—Virchow's explanation of the formation of hæmatoma is that the dura mater is inflamed and produces a pseudo-membrane into which the blood is effused. The false membranes, according to him, may be formed of many strata—even as high as twenty-five—rich in blood-vessels. The observations of Schuberg,‡ Charcot, Vulpian, Geist, and

* *Maladies des Enfants*, Barthez and Sanné, Paris, 1884, vol. i, p. 152.

† *Acute and Chronic Inflammation of the Brain*, Ziemssen's *Cyclopedia*, vol. xii.

‡ *Ziemssen's Cyclopedia*, vol. xii, p. 388.

Guido Weber agree with those of Virchow. Obersteiner offers two explanations; one is that primarily there is a hæmorrhage into the subdural space, from the rupture of one or more blood-vessels in the dura. The fibrin contained in the extravasated blood coagulates on the inner side of the dura mater, thus forming a thin pseudo-membranous cyst, which envelops the serum. Eventually the serum is absorbed, and blood-clots in various stages of organization are frequently found at the post-mortem examination. This is mainly Huguenin's view also.

The other theory offered by Obersteiner is similar to Virchow's, and is the one most commonly accepted.

The inflammation of the visceral side of the dura mater results in the formation of a "delicate layer," attended by a wandering out of the leucocytes from the dura. A thin membrane, rich in blood-vessels, in which the lymph cells play a prominent part, is then developed. These blood-vessels unite with those of the dura, and so obtain their supply of blood. The blood-vessels are extremely delicate in texture, and hæmorrhage occurs very easily. The blood itself may be absorbed, but the coloring matter and sac wall remain. So the layers may be multiplied almost *ad infinitum*.

Bartholow reports a case of exceptional interest, where the cyst was so large that it pressed heavily upon the brain substance, flattening the convolutions,

obliterating the sulci almost entirely, and contracting the ventricle.

Whitall notes a case occurring in a negro, in which the hæmatoma extended over one side of the brain, and was an inch deep.

Hyrtl* states that the skull is frequently found to be exceedingly thin when there is hæmatoma, but Kokitansky and Textor† take the contrary view.

Hæmorrhagic pachymeningitis is almost always found at the vertex, and is usually evenly distributed on both sides of the cerebrum. Huguenin says that fifty-six per cent. occur on both sides—forty-four on one side.

Symptoms.—The symptoms of hæmatoma are slow in developing, and in many cases it may exist without its presence being suspected. The symptoms closely resemble that of cerebral softening. Loss of memory, weakness of intellect, severe circumscribed headache—which may be the only symptom—vertigo, contracted pupils (Griesinger), and tinnitus aurium. Not infrequently there is diminution of muscular power, rarely amounting to actual paralysis, but sometimes there is hemiplegia. Wakefulness is another symptom, or there may be stupor. Sleep is disturbed by unquiet dreams. Patient may remain in any of these conditions for weeks, or even months. Usually there is no fever. Pulse is irregular; may be full and slow,

* Ziemssen's Cyclopedia, vol. xx, art Meningitis.

† Würzburg Verhandlung, vii, 1857.

or small and rapid. Sometimes muscular twitchings and contractions occur. Aphasia is sometimes present. No perversion of sensation. Coma may precede death, or the recovery may be gradual. The symptoms may be intermittent, and relapses are frequent. There may be convulsions, or marked symptoms of apoplexy.

Huguenin* has formularized an interesting table of this disease:

34	per cent	had a duration of	from 1 to	5 days.
40	"	"	"	" " " 5 to 30 "
18	"	"	"	" " " 1 to 6 months.
4	"	"	"	" " " 6 months to 1 year.
4	"	"	"	" " " over 1 year.

Diagnosis.—According to the observations of Legendre,† the most noteworthy diagnostic symptom is persistent contraction of the hands and feet. But this is met with in many other diseases. Jaccond‡ says that the exceptional presence of fever, the contracted pupils, the absence of emesis and general convulsions, slow and irregular pulse, and no paralysis of facial nerves, intense and continued headaches, and stupor, are diagnostic symptoms of hæmatoma. But these symptoms are common to many other diseases, and in summing up I find them so equivocal and un-

* Ziemssen's Cyclopædia, vol. xxii, p. 423.

† Recherches sur Quelques Maladies de l'Enfance, Paris, 1846.

‡ Traité de Pathologie Interne, tome i, Paris, 1870.

certain that, as in the case of pachymeningitis, the diagnosis is best made by exclusion, or by accurate observation of the consecutive chain of symptoms.

It may easily be mistaken for acute meningitis, apoplexy from hæmorrhage, delirium tremens, etc.

Prognosis.—Although the prognosis is usually unfavorable, the disease does not always end in death, except when caused by alcoholism.

Cruveilhier and Goschler* report cases of recovery. Schuberg tells of the recovery of a patient from this disease, but he became an imbecile. Bartholow says that recovery is possible, but it is doubtful if the mental faculties are ever wholly regained. Griesinger† reports a case of partial recovery and the patient lived for years afterward and exhibited but few symptoms of his illness. Ranney noted a number of wonderful recoveries in syphilitic cases. Steffen‡ says that, when this disease attacks children, recovery is rare, although in other forms of meningitis they frequently recover, because the pus easily escapes through the open sutures and fontanels.

Treatment.—The treatment of hæmatoma is entirely dependent upon its cause, and the source and primary symptoms should be carefully studied. In

* Allg. Wien. Med. Zeit., No. 647, 1865.

† Archiv. der Heilkunde, 1862.

‡ Quoted by Minot. Pepper's System of Medicine, p. 709.

children, leeches behind the ears, cold applications to the head, and counter-irritation are advisable.

In the adult, absolute rest, cold to the head, etc., should be prescribed. Croton oil applied to the head is strongly recommended. Also, large and frequent doses of the iodide and bromide of potassium should be given. If the iodide of potassium cannot be borne by the stomach, iodide of colchicum or sodium may be substituted. It has been suggested that the iodides be always combined with Vichy water. Leeches and revulsions, if necessary; milk diet; stimulants, if indicated, judiciously given and carefully watched; venesection has been suggested.

Hammond gives no line of treatment, as he does not believe in the curability of the disease. He considers sinapisms and blood-letting useless. He recommends only the quieting medicines—morphia, etc., to try and alleviate the more painful symptoms.

Bartholow remarks that the treatment of the disease is most discouraging.

Ergot has been spoken of.

Ranney, in cases where syphilis is suspected, advocates the use of large doses of iodide of potassium, given in combination with corrosive sublimate or mercurial inunctions, or fumigations. Lewin* recommends the hypodermatic use of corrosive sublimate. Mercurial baths (black oxide mercury $\frac{2}{3}$ j. to bath,

*Syphilis. Blakiston, Son & Co., 1882.

or calomel). Cod-liver oil and tonics are useful. Diuretics and moderate cathartics are valuable.

The most valuable hint in regard to the treatment of hæmatoma is this: Decide upon your line of treatment, and do not change it, except for good and sufficient reasons. Never give up hope until the patient is absolutely dead.

SIMPLE MENINGITIS.

Simple meningitis is divided into the acute, sub-acute, or chronic forms; and is usually confined to the convexity, or to the base, although semi-occasionally it is widely diffused. All forms of simple meningitis are treated practically in the same way, and in many cases it is extremely perplexing and difficult, if not impossible, to make a differential diagnosis.

ACUTE MENINGITIS.

SYNONYMS.—*English*: Simple meningitis; brain fever; acute cerebral meningitis; acute hydrocephalus; leptomeningitis. *Latin*: Meningo-encephalitis; phrenitis; encephalo-meningitis; encephalitis; meningitidis; encephalitis peripherica sero membranose; meningitis. *French*: Méningite simple; inflammation de la membrane séreuse céphalo-rachidienne; méningite foudroyante. *German*: Acute hirnhautentzündung. *Italian*: Meningite simplici. *Spanish*: Meningitis simple. *Norwegian*: Almindelig hjernebetaendelse.

Definition.—Acute cerebral meningitis is an in-

flammatory non-tubercular disease attacking the pia mater, and at times the cortex of the brain. The inflammation may be circumscribed and confined to the area at the base—*basilar meningitis*; to the vertex—*meningitis of the convexity (verticalar meningitis)*; or it may be widely spread—*diffused meningitis*; or both membrane and brain may be involved—*meningocerebritis*.

Etiology.—Meningitis may occur idiopathically, or it may be caused by transmission of diseases in conterminous structures. The idiopathic variety is said to be very uncommon, and its causes are so far practically discoverable. Ranney doubts that there is such a disease as pure idiopathic meningitis. Stillé says that it is probably unknown, or at any rate is extremely rare.

In my own experience I have met with twenty-six cases of idiopathic verticalar meningitis, and two of basilar. In one of the former variety there was also a glioma occupying nearly the whole of the left occipital lobe, and strongly adherent to the skull. But it must be remembered that, with the exception of one case, my patients were all more or less mentally defective, and their brains *may* have been undergoing some concealed and unrecognized structural change which culminated in meningitis. But I believe firmly in idiopathic meningitis, and merely advance the above as a chimerical theory.

According to Pepper, the frequency of acute

meningitis is much less than the tubercular. Rilliet and Barthez, during their researches, met with only five cases of simple, while they found thirty-three of the tubercular form. Bouchut met with two of the former to six of the latter. Barrier found only four cases of simple meningitis in thirty autopsies. He further adds that he has had three recoveries from what he believes to have been simple meningitis.

Sex and age are the most important predisposing causes of meningitis. It is more frequently found in males than females. According to Parent-Duchâtelet*, and Martinet, the proportion is four males to one female. From personal observation of fifty-one cases, I found thirty-two males to nineteen females. The New York City Board of Health† for 1867, 1868, 1870, 1871, 1872, and 1873 records 4,321 deaths from meningitis; 2,506 of these were males, and 1,815 females; 3,435 were less than five years of age—1,873 males, 1,561 females. This, I think, proves that males are more likely to be attacked, and children more than adults. H. Charlton Bastian‡ says that it is almost as common from ten to twenty as below the tenth year.

Rilliet§ classified acute meningitis under two

* Recherches sur l'Inflammation de l'Arachnoïde, Paris, 1821.

† Nervous Diseases, Allan McLane Hamilton, p. 49.

‡ Quain's Dictionary, p. 943.

§ Arch. Gén. de Méd., t. xii, 1846, Meigs and Pepper, Diseases of Children, p. 530.

heads—the convulsive and the phrenitic; the convulsive occurring most frequently before two years—the the phrenitic between five and fifteen. Rilliet further assumed that dentition had some influence upon the production of the disease.

Hamilton says that, after early life, he believes it attacks adults between the twentieth and fiftieth year. He has found but four cases occurring after the sixtieth year.

Bierbaum* states that he has seen it principally in infants under two years.

Guérsant† asserts that it is most common in adults between the ages of sixteen and forty-five. Referring again to my own cases:

Number of cases treated.....	51
Number of males.....	32
Number of females.....	19
Mean age	13
Extreme ages.....	2 and 30

Baron and Guersant from the study of twenty-six cases make the following report:

4 to 6 months.....	3
8 to 10 months.....	5
2 to 5 years.....	4
5 to 10 years.....	12
11 to 15 years.....	2
Total.....	26

* Die Meningitis Simplex, Leipzig, 1866.

† Art. Méningite, Dictionaire de Médecine, Paris, 1839.

They (Baron and Guersant) think that there is a predisposition in some persons toward this disease. Rilliet and Barthez confirm this opinion.

Wist, Bednar, Hass, and Louis Schmitt agree that meningitis is more likely to occur after the first year, though in a few cases they have found it in children between the ages of six months and one year. Vogel* boldly asserts that it is no more frequent in children than adults.

Rilliet, Barthez,† and Guersant agree that insolation is a common cause. The latter reports a case occurring in a child six months, who was exposed to the direct rays of the sun while lying in a cradle in a garden. Hamilton records a case where the patient was attacked by meningitis after sea-bathing. But he sat for a long time after his bath on the beach at mid-day without any head-covering. James Whitehead‡ gives exposure to the sun as an important cause. Traumatic injuries to the head, contusions, concussions, falls, blows, etc., are frequent causes. Rheumatism, pneumonia, otitis media, eruptive fevers, and prolonged mental labor and excessive brain work, are prolific causes of meningitis.

Posner§ tells of a case of metastatic meningitis,

* Op. cit., 4th American Ed., p. 100.

† Mal. des Enfants, p. 128.

‡ Medical Gazette, London, January, 1844.

§ Encephalopathia Rheumatica. Ibid., vol. 104, p. 176.

where the inflammation fled from the joint to the meninges. Mesnet * also reports a case.

Gintract† collected twenty-one cases resulting from rheumatism, or occurring in connection with its existence, established by post-mortem examination. Oulie‡ contributes four others.

Hammond says: "Although I have witnessed a number of cases of what . . . was designated cerebral rheumatism, I have only had one case in which the existence of meningitis, as a consequence of rheumatism, was demonstrated by post-mortem examination."

Da Costa§ gives twelve cases of meningitis during acute articular rheumatism. He further expresses the opinion that all cases of what is called cerebral rheumatism are not characterized by the presence of meningitis, and his autopsies verify his statements.

Cheadle|| makes the following statement: "It may be possible that the membranes of the brain may be stirred up with rheumatic poison like other serous membranes, but I have not met with such a case."

* Archives Générales, June, 1856.

† Op. cit., tome iii, p. 77.

‡ Du Rheumatisme Cérébral. Thèse de Paris, 1868.

§ American Journal of the Medical Sciences, January, 1875, p. 17.

|| Cyclopedia of the Diseases of Children. Keating, vol. i, p. 805.

Neuwerk* has met with seventeen cases of meningitis caused by, or coincident with, pneumonia.

I have seen four cases of basilar, and one of verticalar meningitis, arising from the same cause.

Otitis media and other ear diseases are undoubtedly common exciting causes of meningitis. The arteries, veins, and connective tissue afford such numerous avenues of communication between the ear and petrous portion of the temporal bone that it may easily explain this. Seeligmüller† advances the theory that the connective tissue, extending through the petro-squamous fissure from the dura mater to the mucous membrane of the tympanum and mastoid cells, contains large ramifications of the middle meningeal artery and vein. The facial nerve, extending between base of brain and ear, is another channel for the transmission of the disease. It is separated by an exceedingly thin partition of bone from the cavity of the tympanum. Inflammatory disease in the cavity of the tympanum may cause disease in both peripheral and middle portions.‡ In my own practice I have met with two cases of basilar meningitis and one of verticalar, following otitis media.

According to Charles West,§ long continued

* *Deutsches Archiv. für Klin. Med.*, xxix, 1881, p. 1.

† *Lehrbuch der Krankheiten des Rückenmarks und Gehirns*, 1887.

‡ London Carter Gray; *Cyclopedia of the Diseases of Children*; Keating, vol. iv, p. 489.

§ *Lectures on the Diseases of Infancy and Childhood*.

otorrhœa is a cause. He recommends that all cases of earache be looked after very promptly.

Larrey* states that, on the retreat of the French army from Russia, the soldiers, who had suffered much from cold and hunger, were attacked by cerebral meningitis directly they reached their comfortable quarters at Königsberg. The disease in most cases proved fatal. Speaking of this epidemic, Hammond remarks that the sudden removal of the mental tension, maintained by the exigencies of the situation in which the army was placed, was the primary cause for the attack. Was it not possible that syphilis, excessive use of alcohol, loss of nerve force, exposure, masturbation, besides many unsuspected latent diseases, might not have caused the attack, when the excitement incident to war had subsided?

Other causes of acute meningitis are the eruptive fevers, erysipelas, typhus and typhoid fever, measles, etc.

D'Après † says that it frequently complicates typhus, but is seldom seen in other eruptive fevers.

Haeddeus ‡ reports one case caused by typhoid fever.

J. C. Wilson § says that when it occurs in connec-

* *Memoires de Chirurgie Militaire et Campagnes*, Paris, 1817, tom. iv, p. 139.

† *Arch. Gén. de Méd.*, 1849.

‡ *Berliner Klin. Woch.*, 1869, p. 564.

§ *Cyclopedia of the Diseases of Children*. Keating. vol. i, p. 471.

tion with typhoid fever he does not know whether the typhoid poison concentrates itself on the cerebral membranes, or whether it is a mixed disease—typhoid fever and meningitis.

I have met with two cases of verticalar meningitis and one of basilar, following measles.

Bastian gives altered nervous influences as a cause for acute meningitis, and affirms that it frequently occurs after severe moral agitations.

Gordon* reports two cases of meningitis by metastasis.

Benson reports a case which occurred in a girl, aged seventeen years, after the enucleation of an eyeball.

According to Leyden and Foerster, chemosis is an occasional cause.


Billod says it often attacks the insane, hard drinkers, and persons in the last stages of Bright's disease. Minot† avers that it is but occasionally found in Bright's disease, the symptoms of meningitis being usually caused by uræmia.

Barron speaks of a case of meningitis due to excessive school work.

Spitzka‡ maintains that the recorded cases of "meningitis from overstudy" are only cases of "grave

* New Orleans Medical and Surgical Journal, 1849-50. vol. vi, pp. 211-213.

† Pepper's Cyclopedia of Medicine, p. 717.

‡ "Insanity." Spitzka. P. 248.  Note.

delirium, brought about as much by the emotional strains attendant on competitive examinations as by the mental effort itself." He further says: "It is never the strong mind nor the healthy body that suffers in this way. The 'mental hygiene' sensationalists are evidently unaware of the existence of such a disease as grave delirium, and ignorant of the fact that the disorder which they attribute to excessive study is in truth due to a general vitiated mental and physical state, perhaps inherited from a feeble ancestry. Our school system is responsible for a great deal of mischief, but not for meningitis."

Some of the other causes of acute meningitis are: Excessive insomnia, nasal diseases, pleurisy, extension of disease from other viscera, phlebitis, gout, carcinoma, carbuncle, tertiary syphilis, the sudden recession of exanthematous diseases, and, it has been stated, on what authority I do not know, meningitophobia.

It may not prove uninteresting for me to give a hasty résumé of the more important causes of acute meningitis, and I can find no better grouping than that of Ambrose Ranney:*

Predisposing Causes.

1. Age—youth or young adults most frequently attacked.
2. Sex—males more frequently attacked than females.

*Lectures on Nervous Diseases, p. 294.

3. Anxiety—prolonged mental labor, and grief.
4. Excessive use of alcohol.

Exciting Causes.

1. Injuries to the bones of the head.
2. Caries or necrosis of the cranial bones.
3. Otitis media.
4. Insolation.
5. Extension of inflammation from the orbit and vertebral ligaments.
6. Metastasis of skin eruptions.
7. Blood poisons, chiefly those of fevers, pyæmia, rheumatism, uræmia, diabetes, and diphtheria.

Pathological Anatomy.—In basilar meningitis the morbid phenomena are confined to the base—in verticalar to the convexity. According to Landon Carter Gray,* when acute meningitis is caused by infectious diseases, it is more commonly found at the vertex; when by aural or nasal diseases, on the external aspects and base.

The dura mater is usually somewhat injected, the larger vessels containing blood in various periods of coagulation.

There may be extensive thickening and opacity in the arachnoid, more especially at the vertex. Sometimes there are small cloudy spots scattered through it. Obersteiner† has observed this in chronic

* Keating's Cyclopedia of the Diseases of Children, vol. iv, art. Cerebral Palsies and Suppurative Meningitis, p. 480.

† The Anatomy of the Central Nervous Organs, 1890, p. 385.

brain diseases—more especially in idiots. Rosenthal* describes it as occurring in the chronic meningitis of idiocy. I have only observed the thickenings and opacities in two cases.

According to the observations of Meigs and Pepper, the arachnoid is usually smooth and transparent. I have never seen any marked change in it.

The pia mater in the earlier stages of the disease is much congested, and is variegated in color from a deep scarlet to shrimp-pink or a delicate salmon. Sometimes there are superficial deposits of purulent matter.

The perivascular spaces contain a purulent infiltrated exudation of turbid yellow, sage-green, or gray serosity, in which are many migrating blood corpuscles. Sometimes the convolutions are “repressed, flattened, and ischæmic.”

Frequently the pia mater is found covered with pus, and firmly attached to the cortex. This is very common in idiocy.

The brain itself may be covered with lymph or pus, which may also contain numbers of leucocytes. In children the cerebrum is apt to be much softened. Serous effusion sometimes takes place into the ventricles. It may be transparent, but more often it is purulent.

In chronic meningitis the membranes are thick

‡ Diseases of the Nervous System, p. 15.

and closely adherent to each other and the brain. The cranial nerves and the medulla are surrounded by pus. Frequently distended vessels run through strands of exudation, and when the infiltration is just beginning it is in the region of the vessels.* The portion of the membranes not the root of exudation is a vivid scarlet from intense injection of smaller blood vessels.

The choroid plexus is usually congested, and is not infrequently covered with pus.

The sinuses in many cases are filled with blood and contain thrombi.

According to Gray,† microscopical examination reveals micro-organisms. They can be either examined by cultures and inoculations, or inoculations without culture. Netter collected 25 cases of his own and 45 of others. In his may be found six species of micro-organisms, 18 pneumocci, two streptococcus pyogenes, two microbes resembling the intra-cellular dipoccus of Weichselbarem, one short bacillus of great mobility, presenting most of the characteristics of the typhoid bacillus; one having the characteristics of the pneumo-bacillus of Friedländer, and in one case certain unknown bacilli that were very "delicate and flexible." The 45 tallied with his own in the main.

* Practical Pathology. John Steven Lindsay, 1887, p. 233.

† Keating's Cyclopedia of the Diseases of Children. vol iv, p. 491.

Netter is inclined to believe that the difference in the exudation is due to the micro-organism causing it. He says the exudation in which the pneumococci are found is always very viscous and greenish, and the meningitis frequently coincides with ulcerative endocarditis, although the affection is relatively a benign one. In the cases in which the streptococcus was found the exudation was less adherent and not of a sero-purulent character, while in cases in which the bacillus Friedländer was the exudation was viscous and thick. De Hart* states that he has frequently found calcareous plates in the various cerebral membranes, especially in epileptics and in chronic meningitis. He has also, though rarely, found true ossification presenting itself in the form of spiculæ of bone. He has never seen bone corpuscles in the former, but they are always present in the latter. His explanation of the formation of these morbid products is that the calcareous plates owe their origin to a deposit of calcareous salts in the exudation. The bone is the result of genuine organizing action, through the medium of cells, precisely as in normal bone.

Erlenmeyer found the commissure of the optic nerves hardened by calcareous deposits in the brain of a monomaniac who died of epilepsy.

Herschl† reports a patient, aged twenty-six years,

* The Journal of Nervous and Mental Disease, 1878, p. 245.

† Schmidt's Jahrbücher, 1863.

who died of melancholia, in whose brain was what he called ossification of cells. .

De Hart also says that he found the falx cerebri partly ossified in an insane patient.

In one patient I found a small spicula of bone imbedded in the membranes.

Symptoms.—The invasion may be very sudden, but there is frequently a prodromal period marked by uneasiness and restlessness. These symptoms may continue for a day or two. In children a violent convulsion may usher in the disease, but there is usually the stage of excitement followed by the stage of debility.

There is always intense, persistent, localized headache, accompanied by excitation of the special senses. It is confined to the frontal, temporal, or occipital regions, and is exaggerated by any noise, however slight. In basilar meningitis the cerebral symptoms are not so prominent as in verticilar. A chill may be the first symptom, followed by giddiness, nausea, emesis, and epistaxis. There is extreme thirst and complete loss of appetite. Temperature is usually 104° or 105° F., frequently running up after death to 106° . Pulse is tense, small, and irregular; it ranges proportionately with the remissions and exacerbations of the temperature—from 110 to 120 or 140° . The features are pinched and contracted. Face may be grayish-white in color, or suffused by a dull red flush. The *tache méningitique* of Trousseau may

frequently be observed after sweeping a finger delicately over the cheek; teeth are covered with sordes; tongue heavily coated with thick white or cream-colored fur.

In many cases we have strabismus, contraction or dilatation of the pupils—or they may be irregular. Conjunctiva is always strongly injected, and photophobia is an almost constant symptom. May have diplopia.

There is always more or less mental confusion, which may be a low muttering delirium alternating with lucid intervals, or it may increase to a mild attack of acute mania, with illusions and hallucinations. Occasionally the delirium merges into pure insanity, with homicidal or suicidal tendencies.

The gait, in the early stages, is tottering. Many have muscular incoördination, and as a result, ataxic aphasia. According to Bartholow, we may have true aphasia from deposits along the middle cerebral, and attendant compression of the supposed speech centre.

Diagnosis.—According to Stillé, severe headache, excitation of senses, high fever, muscular spasm, somnolence, coma, and muscular relaxation are proofs of the existence of acute meningitis. The succession of symptoms, as noted by Gray,* are: Delirium, hebetude or coma, fever, convulsions, muscular twitchings,

* Keating's *Cyclopedia of the Diseases of Children*, art. Cerebral Palsies and Suppurative Meningitis, vol. iv, p. 491.

headache, paralysis, and optic neuritis. But these symptoms are not confined to meningitis alone, but are found in many other brain diseases. He lays special stress upon the importance of optic neuritis as a diagnostic symptom, but it is rarely present. He further remarks that a diagnosis cannot be made by observation of the cerebral symptoms alone, but must depend upon the cerebral symptoms, together with the causes which are most liable to cause meningitis.

It must be remembered that, according to some of the best authorities, meningitis is particularly liable to attack children. Finlayson* remarks that, since the time of Hippocrates, when a child is seen lying with half-closed eyes, it is taken as a sign of some brain disease. He does not attach much significance to it, however, as the same condition may occur from narcotics.

Ranney says that it may be confounded with delirium tremens, acute uræmia, and smallpox.

Carr easily distinguished it from delirium tremens, by age of patient, absence of clammy perspiration, intense headache, and peculiar delirium. Also by temperature, pulse, and pupils.

It may be diagnosed from acute uræmia by analysis of urine, by the odor, and by the absence of uræmic convulsions.

It is difficult to differentiate between acute men-

* Keating's Cyclopedia of Diseases of Children, p. 107.

ingitis and small-pox until the eruption appears. But in meningitis there is no pain in back and loins.

J. C. Wilson* says that the differential diagnosis between acute meningitis and typhoid fever would be recognized by the abrupt attack of meningitis, the severe headache, the persistent emesis, obstinate constipation, the irregular temperature, the course of the disease, and the herpetic or petechial eruptions.

Acute meningitis, like pachymeningitis and hæmatoma, is extremely difficult to diagnose, it being one of the most enigmatical and obscure of diseases. Its symptoms are found in many other diseases. The main factor in the diagnosis, after all, is that in all other diseases some other part of the body is attacked, and the brain symptoms are less marked.

The diagnosis between verticilar and basilar meningitis may be made by observing that in the former the disorders of intellection are more marked; in the latter, motion and sensation.

The respiration is labored, irregular, and shallow—Cheyne-Stokes variety; abdomen much retracted and flattened. There is obstinate constipation, urine scanty and dark-colored, sometimes have retention. In many cases there is grinding of the teeth, and tinnitus aurium is often present. There may be trismus, subsultus tendinum, and cutaneous hyperæsthesia. Paralysis—hemiplegia, or paraplegia—occurs some-

* Keating's Cyclopedia of Diseases of Children, p. 480.

times. In some cases there is a herpetic eruption; in others, optic neuritis. Choked disc and dilated veins may be seen by an ophthalmoscopic examination. The patient may become comatose, and death is caused by heart failure.

The base of the brain is more often attacked in children than in adults.

The patella reflexes are said to be diminished, or to be absent entirely, during an attack of meningitis. This has been contradicted in part, and the reflexes are said to be exaggerated in the early stages of the disease, but when the patient becomes comatose they are apt to be destroyed, at least for a short time.

Prognosis.—The prognosis of acute meningitis is exceedingly grave, but recovery occasionally does take place. I know personally that out of my fifty-one recorded cases there were thirteen recoveries. One well-known physician gives the mortality as three out of four, another as four out of four.

Vigla* reports thirty deaths out of thirty-nine cases. Cragie† reports three out of four cases that terminated fatally.

Ranney says: "Severe cases usually terminate fatally within ten days; less acute cases may end in recovery. When paralysis of limbs occurs, when ptosis, or strabismus, hiccough, when temperature is

* Actes de la Soc. Méd. des Hôpitaux de Paris, 1865.

† Edinburgh Medical and Surgical Journal, 1834, vol. xli, pp. 71-76.

high and shows no morning remission, and when Cheyne-Stokes respiration is developed, then it is almost always fatal."

To quote from Charlton Bastian:* "A large number of deaths take place within the first week of acute meningitis; a much smaller number survive till the end of the second week; fewer still reach the end of the third; and only a very few survive the fourth week. It is difficult to say what the percentage of recoveries may be; but probably less than ten would survive out of a hundred cases of acute idiopathic meningitis."

Bartholow says: "Perfect cures have been reported, but a doubt of their genuineness must always be entertained."

Dr. James Barr,† of Liverpool, England, thinks the prognosis of meningitis is most favorable. In thirteen cases of simple meningitis, he lost but one. Seven were hospital cases—six occurred in private practice. Of these six, four entirely recovered, one had a slight internal squint of one eye, and the other became wholly blind.

There are almost always some sequelæ to meningitis. Meynert asserts that there is always some mental weakness which manifests itself in imbecility, with hallucinations and delusions. I have noted marked mental deterioration in four cases of recovery

* Quain's Dictionary of Medicine, p. 945.

† Therapeutic Gazette, Feb. 1891, p. 80.

from acute meningitis. Insanity is not an uncommon sequel.

Dr. John Guitéras states that most of the deaths in the tropics among children are caused by "acute cerebral and meningeal affections." The death-rate in the city of Havana is extraordinarily high.

Indeed, Dr. Guitéras considers meningitis a more common cause of death among the natives than yellow fever itself.

I have taken the following tables from his brilliant article on Yellow Fever:*

*Annual Death Rate Per 1,000 of Living Population
from Meningitis, etc.*

For the United States, census of 1880.....	0.20
Louisville, Ky. (highest in the Union).....	0.50
Havana, mean of seven years.....	1.27
Key West in yellow-fever years.....	1.40
Key West in no-fever years.....	1.27

Number of deaths in City of Key West, per 1,000 of living population, from certain specified causes that might be confused with yellow fever. The rate given is that of the quarter of the year having the greatest mortality from yellow fever, contrasted with the same quarter in no-fever year.

* Keating's Cyclopedia of the Diseases of Children, p. 853.

Yellow-fever years.	A. Meningitis, cere- britis, cerebro- spinal fever, etc., in chil- dren.		No-fever years.	Yellow-fever years.	B. Tubercular meningitis		No-fever years.
1875	0.28	0.37	1877	1875	0.	0	1877
1878	0.46	0.37	1877	1878	0.	0	1877
1880	0.40	0	1879	1880	0.	0	1879
1881	0.37	0.26	1882	1881	0.09	0	1882
1881	0.37	0.16	1883	1881	0.09	0	1883
1881	0.37	0.15	1884	1881	0.09	0	1884
1887	0.56	0.21	1885	1887	0.25	0	1885
1887	0.56	0.40	1886	1887	0.25	0	1886
Total.	3.37	1.92			0.77	0	

The average death-rate corresponding to these figures is:

1.68 0.96 0.38 0

Treatment.—The treatment of meningitis has been a vexed question for many years. The cause of the disease should always be carefully noted, and anything that irritates should be removed.

The patient should be placed in a cool, dark, quiet room, and the head slightly elevated. The hair should be shaved off, or at least be closely cropped.

Meigs and Pepper* say: "It must be evident, it seems to us, that but little dependence can or ought to be placed on any but prompt and powerful *antiphlogistic* treatment. *Depletion*, therefore, *mercury*,

* Diseases of Children, p. 535.

cold applications to the head, *laxatives*, *caunter-irritants*, and the most rigid diet ought to be employed from as early a period as possible."

Ranney suggests, in the first and second stages, when there are evidences of congestion, that leeches be applied to neck or temples, or to the inside of the nostril, so as to deplete directly from the superior longitudinal sinus. Rilliet and Barthez deprecate the application of leeches to the head, and recommend their use to lower extremities or about anus. Gölis* applies leeches behind the ears. Holland recommends the application of leeches to the hæmorrhoidal veins. We may resort to venesection. Ranney doubts the advisability of extracting blood from children, but sanctions it in healthy, vigorous adults, and says we can draw as much as fifteen ounces without danger. J. W. McKinney† urges the necessity of free venesection in the early stages of the disease. Quintana‡ strongly advocated local bleeding, together with the free use of digitalis and belladonna; we may cup the nape of neck, and encourage the flow of blood by hot poultices, frequently renewed. It must be remembered that the amount of blood withdrawn must be in inverse proportion to the strength of the patient.

Counter-irritation is much resorted to in the

* Praktische Abhandlungen, vol. i, case 2.

† Northwest Medical and Surgical Journal, Chicago, 1856, lxiii, pp. 118-125.

‡ Gac. Méd., Madrid, 1850, vi, pp. 321-323.

earlier stages of this disease. Bartholow recommends the application of mustard plasters to forehead and neck three or four times a day, allowing them to remain until the skin is slightly reddened. He condemns severe counter-irritation, as does Valleix.* Rilliet takes the opposite view. He recommends 15 or 20 drops of castor oil rubbed over the bare scalp from four to six times a day. E. Solles† recommends vigorous revulsive treatment. He reports one case in which patient recovered, but lost his sight; some time after was attacked again by meningitis, with effusion. Intellectual faculties were abolished for five months. Treated the second attack with iodide of potassium.

Seulis‡ and Constant§ used the actual cauteries, and the latter was exceedingly fond of the moxa.

Thibault|| records a case of meningitis occurring in a boy six and a half years old. He employed frictions of "*pommade stibiée*" upon the shaved head, and the child recovered.

Max Buch¶ slightly scarifies the scalp and then rubs in a mixture composed of equal parts of turpentine and croton oil. He advances the theory that cutaneous irritation of a proper degree of intensity

* *Op. cit.*, t. ix, p. 187.

† *Études de Clin. Interne*, 8°, 1879, pp. 66-73.

‡ *Bull. Gén. de Thérap.*, etc., Par., 1838, xv, 180-183.

§ *Bull. Gén. de Thérap.*, etc., Par., 1835, ix, 303-307.

|| *Gaz. d'Hôp.*, Par., 1859, xxxii, p. 102.

¶ *Archiv. f. Psych. n. Nervenk.*, xx, I.

causes increased temperature of the scalp, with a lower temperature and vascular constriction of the meningeal vessels.

Vovard, of Bordeaux, combined the use of iodide of potassium internally and croton oil externally. He applied the oil with a brush three times a day until suppuration took place; then used an irritating ointment for several days. He is said to have been very successful in his treatment of this disease.

Cold should be applied to the head by means of an ice-bag, or cloths wrung out of cold water. Benham* asserts that cold to the head has no effect on intra-cranial temperature. Schützenberger† is most enthusiastic in advocating the use of cold affusions. Féréol‡ reports an unusually interesting case of recovery from rheumatic meningitis under treatment by cold baths. He tried all other treatments without success.

Keetley§ treated a severe case of traumatic meningitis which had merged into the comatose condition with the cold douche for two and one-half hours. The patient recovered.

Purgatives are much used in the treatment of

* West Riding Lunatic Asylum Medical Reports, vol. iv, 1874, p. 152.

† Gaz. Méd. de Strausb., 1855, xv. 33-41.

‡ Bull. Gén. de Thérap., mai 30, 1875. Med. News, 1875.

§ Tr. Clin. Soc., London, 1879, xii, pp. 145-148.

meningitis. Compound jalap powder, the salines, castor oil, colocynth, and even croton oil have been highly recommended. To my mind, the best method of moving the bowels is by an injection of Castile soap, glycerin (turpentine, if necessary), and warm water; or by the use of calomel in small doses, frequently repeated. Stillé maintains that mercury is of no especial value, but it has been largely used in various forms. Vogel* urges the use of mercurials, and says the only two children he has seen recover were treated with mercury, both internally and externally. Mazade† employs frictions of mercurials in large amounts.

Rosenthal says that no positive benefit is said to follow the use of mercury.

Cross‡ reports a case of recovery under the use of mercury combined with chalk and iodide of potassium.

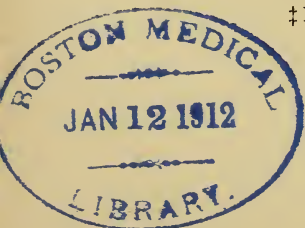
Most authorities agree, with the exception of Dr. James Barr, that our most important remedies in the treatment of meningitis are the iodide of potassium and the bromides, more particularly the bromide of potassium.

Hammond reports wonderful benefits from the use of iodide of potassium. He gives from 90 to 120 grains per day, from onset, until delirium has ceased.

* *Op cit.*, p. 361. Meigs & Pepper, p. 535.

† *Rev. Méd. Franç. et Étrang.*, Paris, 1840, iv, p. 66-82.

‡ *Brit. Med. Jour.*, London, 1876, ii, p. 492.



Meigs and Pepper recommend iodide of potassium from the beginning, if calomel is not used.

Niemeyer affirms that it is a specific in basilar meningitis.

Amidon* says that, as the potassium salts are cardiac sedatives, they tend to diminish arterial tension; and if we weaken the heart which is acting a little more strongly than usual, it gives the veins an opportunity to empty themselves and relieve the distended capillaries.

Dr. E. C. Seguin recommends the iodide above every other remedy. He gave from 30 to 150 grains, three times a day, with no bad results.

The following authorities strongly advocate the use of iodide of potassium in meningitis, and cite numerous cases of recovery under this treatment: Derasse,†, Flint,‡, Jacobi,§, Lyman,||, Peter,¶ and Rodet.**

Landon Carter Gray asserts that in the first stages of meningitis a few large doses of quinine will frequently do much good—from 2 to 10 grains, accord-

* Transactions of New York Neurological Society, Jan. 3, 1882.

† Arch. Méd. Belges, Brux., 1881, 3 S., xx, 377-380.

‡ *Op. cit.*, p. 601.

§ Keating's Cyclopedia of Children, vol. iv, p. 680.

|| American Medical Times, 1862, p. 334.

¶ Bull. Soc. Clin. de Paris, 1878-1879, ii, pp. 145-148.

** Lyon Méd., 1878, xxix, pp. 611-618.

ing to the age of the patient. After the first period, it acts only as a tonic.

Steffen also advocates its use in combination with the salicylate of soda. Debange* employs the sulphate of quinine, and Descrimes† reports a case in which there were delirium and convulsions which he treated with quinine and opium.

Hasbrouck‡ had a case, with every symptom of cerebral meningitis, that he treated with sulphide of morphia. Recovery.

R. C. Holt§ in his treatment uses inunctions of iodoform with good results.

Gray says sometimes the sulphide of calcium ($\frac{1}{20}$ — $\frac{1}{10}$ grain every hour for a day or two) proves of service. He thinks the fluid extract of ergot (℥ v. to f. 3 i. every three or four hours) is invaluable. Lecroix|| uses ergotin.

L. J. Collins¶ tells us of a wonderful case of recovery under the hypodermatic use of veratrum viride.

Fluid extract of gelsemium (℥ i. every two or three hours) has been suggested. Tincture of aconite combined with opium in the febrile stage.

* Gaz. Méd. Clin. de Toulouse, 1874, vi, pp. 73-81.

† Rev. Méd. Franç. et Étrang., Paris, 1827, ii, 188-193.

‡ Med. Rec., N.Y., 1869-70, iv, p. 99.

§ Practitioner, London, 1887, xxxviii, pp. 342-345.

|| Bull. Méd. du Nord, Lille, 1884, xxiv, 462-481.

¶ Clinic Cincin., 1873, iv, p. 61.

Bartholow gives us Lugol's Solution (℥iv. to ℥x.) three times a day.

The diet needs careful attention, and should be restricted to milk, broth, eggs, etc., together with stimulants if the condition of the patient indicates their demand. In speaking of their use, Ranney observes: "My guide to stimulants is effect on pulse and temperature. I believe that many patients die from lack of stimulants in a crisis of disease, especially in inflammatory conditions of the meninges."

I quite agree with him. It has been my experience that in exhausted conditions of the system, when the vital forces are at a low ebb, the human economy needs building up, and the great furnace of life needs replenishing with fresh fuel. Almost all writers condemn the use of stimulants, but, given with great care and judiciously watched, they are of inestimable value. Champagne, brandy, and whisky are preferable to everything else. The stimulants should be given in small doses, and frequently repeated.

In speaking of the treatment of meningitis, Dr. Jones Barr* says: "In this disease I have now completely discarded bromide and iodide of potassium. Of course, in any case when there was reason to suppose that there was a syphilitic basis, I would employ iodide of potassium, or more likely some preparation

*Treatment of Meningitis, Therapeutic Gazette, Feb., 1891, p. 82.

of mercury." He has had no experience in local or general depletion, and says if that were necessary he should prefer to use antimony. He advances the theory that blood-letting might possibly be of use in the beginning of the disease, if there was violent heart action or arterial pressure.

Dr. Barr's treatment may be summed up as follows: The ice-cap, or a cap formed of rubber tubing, through which a constant flow of ice-water is induced; perhaps a cold bath, 90° to 95° F.; an occasional dose of antipyrin when there is excessive fever; but his usual febrifuge is a mixture of carbonate and acetate of ammonia, given in full doses. If there is, in his judgment, danger of a thrombus forming, he gives liq. ammon. fort. in cold water. He places much faith in a large blister, applied at the occipital region. Calomel in small doses, in order to keep movements free. When there is cerebral vomiting, he places a sinapism over the epigastric region, and gives full doses of bicarbonate of sodium and sal volatile at frequent intervals. For hiccough he recommends hypodermatic injections of morphia and atropia. For cerebral excitement he gives opium freely, in combination with salicylic acid. His favorite prescription is:

R Pulv. ipecac. et opii. }ää gr. x.
Acid. salicyl. }

M. et ft. in chart I.

Sig.—This powder to be repeated every three or four hours, for an adult.

He limits his diet to milk, farinaceous food, and butter. He condemns the use of alcohol in any form. In basilar meningitis, when there is danger of bulbar paralysis, he gives atropine in small doses, frequently repeated.

Dr. Barr claims to have lost but one case out of thirteen.

In my own treatment of cerebral meningitis, I have used the iodide and bromide of potassium freely, and regard them almost as specifics after the febrile stage is past. But I qualify and modify the treatment in each case.

In the early stage of cerebral meningitis I know of no more reliable febrifuge than the combination of tincture of aconite root and tincture of belladonna root, in drop doses every hour—well diluted with water. If the temperature remains persistently high, I resort to antifebrin (gr. iii), and repeat in an hour if necessary. If the pulse fails, I give a stimulant, carefully watched.

The great rapidity of the action of iodide of potash makes it an important factor in the treatment of this disease. It is claimed that it passes into the blood and is diffused out in a remarkably short period of time. In fifteen minutes after its administration it has been found in both saliva and urine of the patient. The syphilographers maintain that the iodide of potassium furthers destructive metamorphosis. In meningitis, as in syphilis, there is a lowering of the

vital forces. Under the administration of the iodide, which favors waste, the products caused by the intense inflammation are absorbed and cast out, and the meninges gradually return to their normal condition. It is best given in large quantities of water, as there is less danger of the patient becoming iodized. Rosenthal advances the theory that dilution assists in the quick elimination of the salt.

My reasons for using the bromide of potassium are these: The bromide inhibits the movement of the heart, diminishing both force and frequency of pulsations, and also lessens the strain of the arterial system by causing vaso-motor spasm, and by directly acting on the heart muscle. It also reduces the normal supply of blood to the cerebro-spinal axis, and has a tranquilizing effect on the sympathetic nervous system. It reduces the temperature in a minor degree, which, according to H. C. Wood, is accomplished by the elimination of heat; the relaxed condition of the vaso-motor system, due to the use of bromide, favors the increase instead of diminishing tissue change. My usual prescription of iodide and bromide of potassium is:

R	Potass. iodid. }	
	Potass. brom. } ää 3 vss.
	Syr. sars. comp.....	℥ ss.
	Aquæ.....	q. s. ad ℥ iv.

M. S.: Teaspoonful in four tablespoonfuls of cold water every three or four hours, *night* and day.

I keep the bowels open by means of calomel in small doses, or an enema on each alternate day. I also attend to the condition of the bladder and use the catheter when necessary.

If the patient be particularly restless, I quiet by morphia or opium.

I confine my patient to an absolute milk diet until convalescent, then gradually increase his dietary. I also use milk punch freely. If there is persistent cerebral vomiting that will not be checked by the bromide of potassium, I give:

℞ Antipyrin..... grs. viij.
Mur. cocaini gr. j.
Aquaë $\frac{3}{4}$ j.

M. S.: Teaspoonful (without water) every hour.

Usually one or two doses of this proves effectual.

MENINGO-CEREBRITIS.

This disease occurs where both pia mater and the cortex of the brain are involved in the inflammation.

It is almost impossible to make a diagnosis of this disease during life, but it is frequently seen at an autopsy.

The cortex of the brain is, almost invariably, much softened, and there are unmistakable symptoms of congestion.

The symptoms are practically the same as those

of meningitis, and the same treatment answers for both diseases.

SUBACUTE CEREBRAL MENINGITIS.

Definition.—The subacute form of meningitis differs from the acute in that it is a secondary instead of a primary affection. The length of the attack is longer, and the cerebral symptoms not so pronounced as those of acute meningitis.

Ætiology.—It is always the result of some irritating disease—cancer, Bright's disease, typhoid fever, rheumatism, long continued bowel troubles. In fact, many of the causes which produce acute meningitis occasion the subacute.

Pathological Anatomy.—It presents almost the same appearance as the acute, except that the exudation contains less pus and fibrin, and is not so extensive in amount (Ranney). The opacity of the pia is not so marked as in the acute. There are rarely any adhesions to cortex and external membrane.

Symptoms.—The headache lasts but a short time, less than twenty-four hours, and is not so intense as in acute meningitis.

Excessive restlessness precedes delirium. Delirium is less marked than in the acute variety, being usually low and muttering. Coma comes on rapidly. Pulse is slow, respiration labored and puffing, and cyanosis follows.

Convalescence is very tedious.

Diagnosis.—The cause is an important factor in making a diagnosis. Coma is the most marked symptom. The diagnosis is best made by careful observation of the chain of symptoms.

Prognosis.—When complicated with chronic Bright's disease or rheumatism, the disease generally terminates fatally. With other diseases, blood-poisoning of fevers, etc., the prognosis is not so grave.

Treatment.—Blisters at nape of neck. If there be uræmia, use free catharsis, hot-air baths, diuretics, and stimulants, if needed. Give an absolute milk diet, and use freely the iodide and bromide of potassium.

CHRONIC CEREBRAL MENINGITIS.

Definition.—This form of meningitis is not so commonly met with as the other varieties. It is always a secondary disease, and is frequently of long duration.

Etiology.—It may be the continuation of a primary attack of acute meningitis, which is rare. It may be caused by other brain troubles—tumors, otitis media, alcoholism, syphilis, etc. Paresis is a most common cause. Heredity is another. Privation, extreme anxiety, grief, or great emotional excitement, all cause this trouble.

It is seldom met with before adolescence. Most common after fiftieth year.

Hammond says that cooks are likely to be attacked, as they are so much exposed to heat. Injuries to head may cause it.

Pathological Anatomy.—The pia mater is much thickened and opaque, and is closely adherent to the arachnoid and the cortex. There is an effusion of serum, pus, or lymph. Cysts may be formed by the exudation becoming a false membrane. The pachionian bodies along the falx cerebri may be increased. Ventricles contain an excess of fluid. Lesions found at both base and vertex.

Symptoms.—The symptoms somewhat resemble those of general paresis. Dull headache at vertex is a most prominent symptom. We have tinnitus aurium, dizziness, loss of memory, diplopia, nausea, vomiting, drowsiness, apathy, and delusions. Sphincters imperfect; speech indistinct; paralysis of motion and sensation. May have facial paralysis, strabismus, ptosis, irregularity of pupils, sloughing of eyeball, ischæmia of the papillæ of the retina, blindness or hemianopia. Deglutition is impaired, breathing is irregular, muscæ volitantes, etc.

Diagnosis.—It is extremely difficult, and often impossible, to diagnose during life. We have usually to make the diagnosis by exclusion. When the cranial nerves are implicated, the inflammation is always at the base of the brain.

Prognosis.—If syphilis is the cause of the disease, the patient may recover under active treatment, unless the disease has lasted for a long time. When the disease arises from other causes, the termination is most unfavorable.

Treatment.—Counter-irritation blisters or the actual cautery may be of marked benefit. Mercury, hypodermatic injections of corrosive sublimate, or mercurial bath. Iodide of potassium alone, or combined with small doses of corrosive sublimate, is most useful. The bromide of potassium is good. Subcutaneous injections of strychnia are good when there is muscular paralysis. Look to the condition of bowels and bladder. Keep the patient on an absolute milk diet—stimulants if necessary.

Interesting cases of chronic meningitis are reported by Odier,* Gintrac,† and Broussais.‡

TUBERCULAR MENINGITIS.

SYNONYMS.—*English:* Granular meningitis; acute hydrocephalus; scrofulous meningitis; dropsy of the brain; tubercular leptomeningitis; brain fever. *Latin:* Meningitis tuberculosa; encephalostrumosis; scrôphulous meningitis. *French:* Fièvre cérébrale; méningite granuleuse; méningite tuberculeuse. *German:* Tuberculöse hirnhautentzündung. *Spanish:* Meningitis tuberculosa. *Italian:* Meningite tuberculare. *Norwegian:* Tuberculos hjernebetaendelse.

Definition.—Tubercular meningitis is an inflam-

* Edinburgh Medical and Surgical Journal, vol. ii, 1806 p. 393.

† *Op. cit.*, tome ii, p. 626.

‡ Bulletin de l'Académie Royale de Médecine, tome v, 1840, p. 564.

mation of the cerebral pia mater, accompanied by exudation of lymph and pus, which is caused by the existence of tubercular granulations.

Ætiology.—Heredity is the most important predisposing cause of this disease. Dujardin-Beaumetz says: "There is a fatal law which presides over the evolution of tubercles in different parts of the economy. I refer to heredity, and tuberculous meningitis is no exception to the law." One with a scrofulous diathesis is quite likely to be attacked. "The gelatinous children of albuminous parents" are peculiarly liable to tubercular meningitis, also the children whose parents are phthisical. Tubercular degeneration of bronchial glands, or in fact tubercular disease of any organ, may act as a predisposing cause.

It is essentially a disease of early childhood, although it not infrequently attacks adults. It is most common in children between the ages of two and six or seven years; in adults from sixteen to thirty.

Sex has no influence in the production of this disease—females are as liable to it as males. Poverty—the crowding together of sick people in poorly ventilated houses, badly cooked and insufficient food, and unhealthy hygienic conditions, are powerful predisposing causes of tubercular meningitis. A variable climate is said to have a marked influence in the production of the disease.

According to Dujardin-Beaumetz, disproportion in the ages of parents is a common cause. Also

dentition, and, in adults, nervousness, excesses, and previous cerebral troubles of various sorts. The exciting causes are still involved in doubt. Some of them that are commonly accepted are eruptive fevers, traumatism, ear diseases, Bright's disease, whooping-cough, diarrhœa, mental and moral emotions, prolonged mental or physical strain, and caries of bones of the skull. Uffelmann,* Baeumler, and Oehme mention a number of cases caused by erythema nodosum.

I have attended an unusual number of cases of erythema nodosum, but have never seen tubercular meningitis as a sequela.

Dontrelepont† reports a case of tubercular meningitis following lupus. The patient died, and tubercle bacilli were found in lupus lesions, in blood, and in lungs—there were also nodes in the ileum.

In summing up our present knowledge of the ætiology of this disease, I find that the hereditary transmission of miliary tubercle is in reality the only cause—both predisposing and exciting.

Pathological Anatomy.—Tubercular meningitis most frequently attacks the base of the brain, although it is common in the vertex, or it may be diffused.

Henoch‡ says that cerebral tubercular meningitis

* Keating's Cyclopedia, vol. iv, p. 517. Art. Tubercular Meningitis, A. Jacobi.

† Centralblatt für die Med. Wissenschaften, August 1, 1885.

‡ Centralblatt Zeit. f. Kinderk., May 1, 1879.

is usually complicated by tubercular deposit in some other part of the body—most commonly the thoracic viscera, peritoneum, mesentery, or spinal cord.

Seitz* states that in 130 cases he found tubercular deposits in 93.5 per cent. in other parts of the body. Rufz (quoted by Marshall Hall, p. 94) saw complications in 40 cases. Fenwick† observed the same in a number of cases.

Valleix‡ affirms that in every case of tubercular meningitis in the adult, and in the majority of cases in children, there are tubercles in the lungs.

The pia mater is markedly congested, opaque, thickened, and easily removed. In the meshes is a gelatinous, limpid exudation. Sometimes it is purulent or serous, or it may consist of pus or lymph. The exudation always contains leucocytes and tubercles. Miliary tubercles are found scattered through the pia mater in greater or less numbers. The intensity of the disease is not dependent on the tubercular deposit. The inflammatory symptoms may be most intense, and the number of tubercles small.

The tubercles are semi-transparent, grayish-white elevations, ranging in size from points barely discernible by the naked eye, up to the size of a quince-seed. Sometimes they are massed together, forming

* Die Meningitis Tuberculosa der Erwachsenen, von Dr. Johannes Seitz, Berlin, 1874, p. 317.

† St. George's Hospital Reports, vol. vii, p. 35.

‡ *Op. cit.*, t. ix, pp. 196-197.

large spots. Frequently these spots will form about the walls of an artery and completely stop the flow of blood.

The lateral ventricles are often distended with serum and their walls are softened—sometimes nearly diffuent. They frequently press upon and flatten the convolutions of the brain.* The cortex is dry and shining, and the walls of the blood-vessels undergo tubercular change.† The hemispheres and cranial nerves are frequently glued together by the inflammatory products. The Sylvian fissures, pedunculi, optic chiasma, pons varolii, and cerebellum are the usual seats of exudation.

Symptoms.—The invasion may be rapid, but more frequently it is very insidious. There is usually a well-marked prodromal period, which varies from a few days to several weeks, or even months.

Patient is anæmic; appetite fails; may have propulsive vomiting unaccompanied by nausea. Marshall Hall cites this as a most important diagnostic symptom; is apathetic; complains of persistent headache and giddiness; sits with head resting on hand a great part of the time; is apathetic, or may be irritable, whimsical, and uneasy. Constipation is usually marked, although in some cases it may alternate with attacks of diarrhœa; may be troubled with conjunc-

* John Lindsay Steven, p. 234.

† Rindfleisch, Syd. Soc. edit., vol. ii, p. 312.

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tivitis, photophobia, and diplopia; sleeps badly; has night terrors; the dreams are of the most vivid description, and patient will awaken from sound sleep shrieking with fear; may grind teeth.

D'Espine and Picot call special attention to the peculiar tottering, reeling walk of the child, while its face shows extreme apprehension. They describe this symptom under the name of "static ataxia." It appears early in the disease.

For convenience of study we divide tubercular meningitis—after the prodromal period—into three stages: 1. *The stage of excitement.* 2. *The stage of depression.* 3. *The stage of collapse.* It must be remembered that frequently in actual practice it is impossible for us to observe these theoretical divisions.

First Stage.—The most noticeable symptoms in this stage are: *Headache, vomiting, and constipation.* The headache is usually most intense. It may be a localized frontal headache, or it may be diffused. Young children roll the head from side to side, bury it in the pillow, and frequently strike at it from the severity of the pain, at the same time giving a sharp strident cry, described by Coindet as the "hydrencephalic cry." The headache is increased by noise and light. Vomiting is persistent, and will sometimes continue throughout the first stage of the disease. Constipation is usually most obstinate; emaciation marked; abdomen retracted, and much hyperæsthesia exists. The flow of urine is diminished. Tempera-

ture ranges from 101° to 105° F.; morning decline, and evening rise; pulse usually slow and intermittent, 110-120.

The tongue is coated, and breath heavy and offensive; teeth covered with sordes. If the inflammation is not very intense, there is at first no derangement of intellection. The patient may be only restless, and grind teeth. More frequently we have low muttering delirium, which may give place to a wild maniacal delirium with delusions. Eyes half-open and expressionless; pupils may be dilated or unequal; photophobia or internal strabismus; face dull and grayish-blue in color; cheeks sunken; face may flush in clearly-defined red spots. The "*tache méningitique*"* may be new. There may be violent convulsions accompanied by complete loss of consciousness, or there may be tonic spasms of muscles of head.

Paralysis is not uncommon, and is generally unilateral; respiration interrupted, labored, and irregular. Patient finally becomes apathetic. Apathy rapidly merges into somnolence; can be roused to take food or medicine; gradually becomes comatose.

Frequently the patient emerges from the lethargic state, and appears almost convalescent. But the symptoms invariably return with renewed violence.

Second Stage.—Patient remains in a state of most

* *Op. cit.*, Leçon, IV, *Fièvre Cérébrale*.

profound coma, from which he cannot be roused; keeps one knee flexed—the other extended; one hand applied to genitals—the other to head (Minot); eyes partially closed—much congested and covered with a film; pupils widely dilated—nystagmus. There may be a thick creamy exudation from the glands of Meibomius; ptosis of one lid—face is lead-colored and expressionless; ecchymoses where skin touches pillow; fæces and urine passed involuntarily. Temperature remains high; pulse slow and irregular; respiration labored; deglutition impossible. Sometimes the patient is almost in a state of opisthotonos. Occasionally he utters that “hydrencephalic” cry, accompanied by contractions of the facial muscles. Ophthalmoscopic examination reveals varicose veins in the retina, hæmorrhages, and choked disc.

Galezowski* asserts that we never have eye disturbances unless we have a tubercular deposit on the chiasm.

Third Stage.—The patient lies as though he were dead. Temperature usually ranges from 101° to $103\frac{1}{2}^{\circ}$. Pulse extremely rapid, feeble, and intermittent from paralysis of the pneumogastric nerves. There may be convulsions. Eyes fixed and staring; pupils widely dilated. There may be diarrhœa. Patient bathed in cold perspiration. Extremities grad-

* Union Méd., 1867.

usually grow cold; Cheyne-Stokes respiration. The patient is now "*sans* everything," and death speedily ends his suffering.

The ordinary duration of tubercular meningitis is from sixteen to twenty-one days. One case* is said to have lasted for twelve months. Several are reported as having continued for ten weeks.

Diagnosis.—Tubercular meningitis may be mistaken for a number of diseases, but those which it most commonly resembles are typhoid fever and simple meningitis.

In typhoid fever we usually have a pronounced diarrhœa, other abdominal symptoms, and the rose-colored eruption.

The invasion of simple meningitis is more rapid, and the course of the disease is much shorter, than the tubercular variety.

Severe headache, vomiting, and constipation, in this succession, are regarded by Stillé as absolute proof of the existence of this disease. Marshall Hall, as I have mentioned before, lays special stress on propulsive vomiting without nausea, as an important diagnostic symptom. The half-closed eyes, ptosis of one lid, inequality and sluggishness of pupils, grinding of teeth, burying head in pillows, and opisthotonos are symptoms worthy of notice in making a diagnosis. The "*tache méningitique*," although not confined to

* St. George's Hospital Reports, 1879.

tubercular meningitis, is an important symptom when combined with others.

Bouchut considered the use of the ophthalmoscope most valuable as a help in making a diagnosis, as by its aid we could see the tubercular deposits in the choroid and retina. Dujardin-Beaumetz expresses it thus: "The ocular examination with this instrument really enables us to make an autopsy before death, by showing us the tubercular granulations in the fundus oculi."

Prognosis.—The prognosis of tubercular meningitis is most grave. There can be but one termination—death. Even if it were possible for the patient to recover, he would be a mental and physical wreck. But there are a number of reputed cases of recovery on record. In one of his lectures on the subject to his students, Dujardin-Beaumetz* said: "It is undoubtedly one of the most formidable diseases which you will ever be called upon to treat, and one of the most hopeless. . . . The curability of tubercular meningitis is a question which has been much discussed of late years. It has been denied by some, and asserted by others. The problem is a difficult one; it is so easy to confound the tuberculous phlegmasia in its acute manifestations with simple cerebral or fibro-purulent meningitis, which only differ from the other in the absence of the specific granulations.

* New York Medical Journal, vol. xxxviii, 1883, pp. 41-144.

Moreover, there are certain convulsive phenomena, of reflex nature, which may simulate inflammatory meningeal troubles." He reports one case of recovery where both father and mother were phthisical.

Charpentier thinks a cure is possible in the first stage, Guersant in the second stage. He reports one hundred cases of recovery. Two cases are of unusual interest. One case remained well for two months, then died. Of the other he says: "*Il en était sorti dans un état de demi-convalescence, lorsqu'au bout de cinq semaines, il fut repris de nouveau de tous les symptômes de la maladie aigue, à laquelle il succomba: les caractères anatomiques de la méningite tuberculeuse furent parfaitement constatés par la nécropsie.*"

Lebert and Roger each verified his diagnosis by autopsies after the patients had died from other diseases, weeks or months after the attacks of tubercular meningitis. Rilliet has done the same.

Archambault, Blache, Politzer, Hahn,† Bonamy, and Gollis believe in the curability of the disease. Rinteln ‡ and Allbutt report wonderful cases of recovery.

Whytt says that he never cured a case of tubercular meningitis; George B. Wood never saw a "well-

* Méningite Tuberculeuse, Dictionnaire de Médecine.

† Recherches sur la Méningite Tuberculeuse et sur le Traitement de cette Maladie. Archiv Gén. de Méd., 4 Sér., vol. xx and xxi.

‡ Bull. Klin. Wochenschr., No. 21, 1876, p. 287.

marked" case recover. The reports of D'Espine, Picot and Baginsky agree with those above mentioned. Meigs and Pepper, out of thirty-one cases, had not a single recovery.

Seitz * maintains that, when the cases of supposed tubercular meningitis recover, there has been a mistake in the diagnosis. Cadet de Grassicourt† asserts that all cases that are cured are superficial attacks of meningitis caused by syphilis, tumors, etc.

What light the discoveries of Koch may throw on the prognosis of this disease is at present undetermined, but we hope that in the near future some remedy may be discovered that will act as a specific, and make the termination more hopeful.

Treatment.—The vain hope of recovery—since it is impossible to cure this disease—makes its treatment of comparatively little importance. It practically resolves itself into making the patient as comfortable as possible.

Jacobi remarks: "Altogether, no treatment can be entered upon with any degree of probability of saving the patient. There are indications for treatment, and in the present condition of therapeutics we can do no better than to fulfil them, with conscientiousness and—hopelessness."

* Die Meningitis Tuberculosa der Erwachsenen, Berlin, 1875, p. 371.

† Traité Clinique des Maladies de l'Enfance, vol. iii, Paris, 1884, p. 553 et seq.

Place the patient in a darkened, quiet room, and apply cold to head in the various ways mentioned in the article on simple meningitis. If there is much pain, relieve by narcotics and cerebral sedatives—opium, morphia, the bromides—preferably the bromide of potassium, fluid extract hyoscyamus, hyoscine or chloral. Keep bowels freely open; oil, salines calomel, jalap, colocynth. Do not purge. Rectal injections are good. Place on milk diet, beef-tea if necessary. Stimulate judiciously with *brandy*, if indicated. If there is much fever, give tincture of aconite and tincture of belladonna in drop-doses every hour. For vomiting give ice, or if the emesis is very violent I have found the following prescription very efficacious:

R Antipyrin..... gr. viii.
Mur. cocaine..... gr. i.
Aquaë..... ℥ i.

M. Sig.—Teaspoonful every hour until vomiting ceases.

If stupor threatens, apply blisters to nape of neck.

The iodide of potassium in full doses, frequently repeated, is much used. Hammond affirms that it does neither harm nor good. Ranney, Niemeyer, Blache, Bonamy, and Bourrousse de Lafforé* strongly advocate the use of potassium. The formula of Bourrousse de Lafforé is:

* Moniteur des Sciences de Méd., June, 1861.

R Potass. iodidi 5. grammes.
Aquaë..... 60. grammes.

M. Sig.—Teaspoonful every three, four, or five hours, well diluted. Never exceed 2. grammes a day.

Benavente* has used it largely in his treatment of tubercular meningitis. Also Oberlin,† Fleming,‡ and Roeser.§

Lugol's solution has been largely recommended.

Sponge baths of warm water are often grateful to the patient.

The revulsive treatment is largely used by some physicians. In addition to blisters to nape of neck, which I mentioned, a few paragraphs above, they apply them to scalp and behind ears. In some cases they use the actual cautery or moxa. To my mind this is positive cruelty, and the shock to the nervous system does the patient harm, besides inflicting great pain. Hahn gives no internal medication at all, but shaves scalp and rubs in stibian ointment every hour.

Turner, Watson, Bang, and Henriette useunctions of pure croton oil. Rilliet and Barthez use the moxa, also Constant.

De Bellange, Tracy, and Valentin use the red-hot iron. De Bellange reports a case in which recovery took place after the scalp had been scarified with caustic potash.

* Siglo Méd., Madrid, 1863, X, p. 161-163.

† Rev. Méd. de l'Est, Nancy, 1886, XVIII, p. 79-85.

‡ British Medical Journal, London, 1871, I, p. 443.

§ Hufeland's Journal, April, 1840.

Sir Benjamin Brodie used mercurial inunctions, with what he considers good results.

Schützenberger used only a constant stream of ice-water on patient's head.

A case of recovery in a child is recorded by Torci. He cut open the longitudinal sinus from the anterior fontanelle and withdrew eight ounces of blood.

Bleeding used to be extensively practiced, but has fallen into disuse.

Ergot has been spoken of as a good remedy.

Green* and Greenway,† independent of each other, have treated tubercular meningitis with phosphorus, with what they call good results.

Before leaving the subject of tubercular meningitis, I should like to call attention to *prophylactic treatment*. The old proverb wisely remarks that "a stitch in time saves nine." So it is with this dreadful disease, which is far more easy to prevent than cure. When there is reason to believe that there is the least predisposition to scrofulous or tuberculous disease, the patient should be carefully watched and guarded, particularly if he be weak and sickly. The personal hygiene needs special attention. Clothing should be regulated by the season. Regular hours are to be devoted to sleep and exercise. The food should be plain, nourishing, and well-cooked. Sweets should

* Practitioner, London, 1884, XXXIII, p. 438-440.

† British Medical Journal, London, 1884, I, 1145.

be avoided as much as possible. Any tendency to diarrhœa must be checked at once, and, on the other hand, constipation should not be allowed to exist. The tone of the system may be kept up by tinct. ferri cl., syr. ferri iodidi, cod-liver oil, or simple vegetable tonics.

VERTICALAR MENINGITIS—IDIOPATHIC—DEATH.

CASE I.—C. R., aged twenty-two years; low-grade imbecile; could talk a little, but ideas and vocabulary limited; was said to have been normal at birth; when eighteen months old had a number of convulsions; from that time appeared to be perfectly healthy until four years old, when severe epileptic seizures began, and continued at frequent intervals until his death. Father aged twenty-four, mother twenty, at time of C.'s birth. Only child born to mother by first marriage, and nourished by her. Mother was healthy when married, but afterwards developed scrofulous or tuberculous symptoms. First husband died of phthisis, also his father, mother, two brothers, and two sisters. Mother contracted a second marriage. Two children were the result—a girl "still-born," and a boy aged six years, who had phthisis. She became very nervous and attempted suicide. Her father was insane. She had five sisters and three brothers; all apparently healthy.

May 20, 1885.—Had been unusually dull and stupid for several days; cried occasionally as if in

pain, but made no complaint. Walking evidently hurt him, but could detect no cause. No tenderness in spinal region. Pupils were equal, but responded sluggishly; tongue protruded without difficulty. Painted the spinal region thoroughly with tincture of iodine.

May 21.—No fever; constipated; cried out when moved; gave hydrarg. chlor. mitis, gr. iii., at one dose.

May 24.—Improved for two days. Right patella reflex exaggerated; left almost absent. Continued iodine to spinal region.

May 25.—Condition unchanged; skin much irritated by the iodine; suspended treatment.

May 27.—Spinal symptoms had increased in intensity; spasms were more frequent; often placed hands over spine. Ordered Mensmann's beef tonic (tablespoonful four times a day) and as much milk as would take.

May 28.—At one time during night was thought by nurse to be dying, but revived. Conjunctiva was strongly injected, pupils contracted; had periods of unconsciousness. Applied strong counter-irritation to neck and occiput.

May 30.—Was very stupid on 29th; brightened to-day: pain in back continued unaltered.

June 1.—Had frequent spasms on 31st; was more dull and stupid; took milk punch *ad libitum*.

June 6.—Made marked improvement during last few days; was able to sit up. From this time he con-

tinued to improve (with the exception of epileptic seizures, which grew more numerous) until December 2d.

December 2.—He appeared to be ill; pupils were contracted, but he had no fever, nor any signs of paralysis; had no appetite. Began to give him quantities of milk.

December 3.—Pupils were still contracted, but not to the same extent as previous day. Was in a semi-unconscious state; moaned and tossed arms widely. Prescribed: Tinct. belladon. rod., gtt. iv; potass. brom., gr. x; ammon. brom., gr. v; to be taken in water every three hours. Crowded nourishment.

December 4.—Brighter; pupils somewhat dilated; bowels moved; had an attack of screaming during the night. Administered: Potass. brom., gr. x; chloral, gr. v, in water at one dose.

December 7.—Continued to improve until to-day, when suddenly became worse; would utter a single shrill cry at irregular intervals. Choreic movements; skin was intensely red, no eruptions. Gave bromide of potash and chloral until quiet.

December 10.—No change until to-day. In morning began to roll head from side to side; toward evening began to fail.

December 11.—It seemed impossible for him to swallow; irregular movements of arms had ceased almost entirely.

December 12.—Passed a quiet night, and died at 10:55 A.M.

Autopsy.—Held 24 hours after death. Body emaciated; a noticeable protruberance over left eye caused by thickening of the bone, due to frequent falls when having spasms; scalp thin, except over occiput, where it was thickened and adherent to the skull, caused also by falls; skull of normal thickness. A prominence along the median line at the vertex, giving it an appearance somewhat resembling the inverted hull of a vessel. Sinuses healthy; dura mater congested over the frontal and fronto-parietal regions on the left side, also adherent to membranes beneath, over the paracentral lobe on each side, so that the membranes could not be easily separated from it. Fluid in considerable quantity found in the arachnoid; sub-arachnoid fluid in normal quantity. A small quantity of pus on the surface of cerebellum. Cerebellum completely covered by cerebrum. The occipital lobes were narrow behind, conforming to the form of the skull in this region. Middle commissures entirely absent. About three drachms of fluid in the ventricles. Arachnoid and pia mater softened; easily torn. Brain substance anæmic; recent thrombi in basilar and left middle cerebral arteries. A noticeable deficiency in the development of the left third frontal gyrus, leaving a portion of the two anterior folds of the insula exposed.

<i>Weight of Brain.</i>	{	Right hemisphere.....	19 oz.
		Left hemisphere.....	16¼ oz.
		Cerebellum.....	5 oz.
		Pons and medulla.....	1 oz.
		° Total	41¼ oz.

Lungs were normal, except a few scattered tubercles in both apices. Heart somewhat fatty; valves healthy; ventricles filled with dark clotted blood. Abdominal viscera in good condition, save a few small patches of superficial congestion, confined to the ileum. The congested areas had no relation with Peyer's patches. Stomach contained some partially-digested milk.

VERTICALAR MENINGITIS—IDIOPATHIC—RECOVERY.

CASE II.—M. M., aged about two years; considered to be remarkably clever; a demi-blonde. Approximate ages of father and mother about thirty-two and nineteen at time of child's birth. Mother was born of hard-working, honest parents, but was a coarse, ignorant, passionate, hysterical, handsome, voluptuous woman, but a few degrees removed from the common prostitute. She was tall, dark, and rather sparely built. Father, a Dane, rather slender, but sinewy, of the blonde type; medium height; highly nervous temperament, and subject to most violent and ungovernable fits of passion; was formerly an officer in the Danish Army, and came of an intellectual, artistic family. His maternal uncle was one of the most noted Danish sculptors, and was a pupil of Thorwaldsen. Another near relative was a famous opera singer in Copenhagen. He himself was no mean artist, and was well educated. Had been an inebriate for years. Had some venereal trouble,

probably gonorrhœa and soft chancre. When the child came under my care she was recovering from some intestinal trouble, for which she had been treated by another physician. When I first saw her on the evening of August 17th, 1885, she was extremely pale and seemed much exhausted. Moaned, as if suffering great pain; pointed frequently to her head, and tossed restlessly from side to side. Prescribed:

℞ Potass. brom..... 3 ij ʒij.
 Potass. iodidi..... 3 ij.
 Syrupi }
 Aquæ }āā ʒij.

M. S.: Teaspoonful in water three times a day.

Placed her on an absolute milk diet, which I continued.

August 24.—Remained in about the same condition, except developed a slight cough, for which gave simple mixture of syr. prun. virg.

August 29.—Increased the bromide of potash to ten grains at dose. From this time on the child continued to improve, and at an early date in September was discharged cured.

I learned subsequently that the mother disregarded my restriction to a milk diet, and on one occasion gave her ginger cake. She also wheeled her out in the sun several times, and would take her from the bed and shake her violently when the baby cried. The child at the present time is perfectly healthy in

every way, although she is not very robust. She attends school and learns rapidly.

VERTICALAR MENINGITIS—IDIOPATHIC—RECOVERY.

CASE III.—D. L., aged nine years; high-grade imbecile; red hair, blue eyes; could read and write; third child born; labor long and difficult. Mother was always very feeble and nervous. Much troubled immediately prior to the conception of child. Had several shocks during pregnancy. Was frightened by imagining she heard robbers in the house. At another time frightened by a dog. Father aged twenty-five, mother twenty-three, at time of D. L.'s birth. Mother died of phthisis. This disease, and scrofula, are hereditary in her family. Father was an inebriate; died of "typhoidal dysentery." Five sisters and one brother of patient living, all supposed to be mentally sound, but are extremely nervous; three have phthisis.

September 17, 1886.—Was taken suddenly ill; temperature 103° F.; pulse 120. Gave seidlitz powder, followed by tinct. of aconite rad., gtt. j, every hour in water; milk diet.

September 20.—Patient exhibited undoubted symptoms of meningitis; temperature 103° . Continued aconite treatment, and in addition gave:

R Potass. brom.....	3 iv.
Potass. iodidi.....	3 ij.
Syr. sarsp.....	3 j.
Aquæ.....	q. s. ad 3 iv.

M. S.: Teaspoonful in water every four hours, day and night.

September 21.—Temperature fell to 101° F.; complained of intense frontal headache. Allowed him a small quantity of ice-cream.

September 22.—Headache less intense; temperature 100° morning, 101° evening; pulse strong and full. Discontinued aconite.

September 25.—Has been extremely quiet. Slept most of the time, rousing only occasionally to ask for milk; morning temperature 103° , evening 102.4° .

September 27.—Has lost flesh rapidly; skin almost bloodless; eyes much sunken; in morning roused somewhat from lethargic state and talked; temperature 99.2° . At 1 P.M. grew suddenly worse, almost in a state of collapse; stimulated freely and patient revived.

October 1.—Improved gradually until to-day; when suddenly became stupid again; temperature 103.2° ; emaciation more marked.

October 5.—No change. Grows weaker each day: sleeps as though he were dead; cannot be roused without difficulty to take milk and medicine. Continued bromide and iodide mixture.

October 22.—Gradually grew weaker until 21st, then he began to grow better.

October 31.—Convalescing.

December 3.—Discharged in good physical condition.

December 1, 1891.—This boy was discharged apparently "cured." Before this illness he was a re-

markably bright, high-grade imbecile, and exhibited only slight intellectual deficiency. Since the attack he has been slowly retrograding. His memory has failed. He reads with extreme difficulty, and it is almost impossible for him to concentrate his attention even for a short time. Suffers from severe periodical headaches.

BASILAR MENINGITIS—PNEUMONIA—DEATH.

CASE IV.—E. H., aged twenty-three years; idio-imbecile; mute; dwarf. She is of a marked Ethiopian type, but is said to have no African blood in her veins. Condition supposed to have been caused by shock received by mother during pregnancy while visiting a circus. Was much disgusted with a repulsive human monstrosity which E. resembles. Father aged thirty-seven, mother thirty-three, at time of child's birth. Labor was unusually difficult, but instruments were not used. Third child born; two brothers living—healthy. This child was always sick. Mother very nervous, and did most of work for family.

October 30, 1888.—Had been suffering from a mild attack of pneumonia, and was progressing nicely. On evening of this day showed marked symptoms of meningitis. Had been giving tincture aconite root, ℥ i, tincture belladonna rad., ℥ ii, in water every two hours. Temperature 102.9°, pulse 108, firm and regular. Died quite suddenly on 31st.

Autopsy.—Examination made seven hours after

death. Body well-nourished; skin curiously pigmented in spots. Pubes without hair; clitoris much enlarged; scalp thick; skull normal. Most intense congestion of membranes; considerable effusion of serum. The orbital plates were small and encroached on the cribriform plates of the ethmoid, so that the olfactory nerves were covered in. The middle fossa (temporal in right side barely $\frac{3}{8}$ inch deep) appeared a shallow depression in floor of skull. The left temporal fossa exceedingly deep, fully $1\frac{1}{2}$ inches, was overreached by orbital plate anteriorly, and was perpendicular on inner side. All long edges unusually prominent. The frontal lobe was small and narrow, while the frontal arc was comparatively long; the lobes were small on account of the short inferior arc and narrow gyri. The lower half of the medulla was distinctly harder than the upper. Hardening was first apparent above auditory striæ, becoming more marked lower down.

<i>Weight of Brain.</i>	{	Right hemisphere.....	17 oz.
		Left hemisphere.....	16¾ oz.
		Cerebellum.....	4½ oz.
		Pons and medulla.....	1 oz.
			<hr/>
			39¼ oz.

BASILAR MENINGITIS—OTITIS MEDIA—DEATH.

CASE V.—J. B., aged thirteen years; idio-imbecile; arms and eyes in perpetual motion. When eighteen months old had a severe convulsion; another

at two and one-half years. Father aged thirty-eight, mother twenty-seven, at time of child's birth. Mother a low-browed, ignorant woman, so low in the scale of intelligence that her own feeble-mindedness is strongly suggested.

December 18, 1888.—Patient exhibited symptoms of mild meningitis. Gave cathartic and the bromide of sodium, gr. x, every three hours.

December 21.—A copious discharge of pus from right ear. Cleanse thoroughly. Quinine sulphate, gr. xv, twice a day.

December 22.—Became comatose in morning and died in evening. No autopsy.

TUBERCULAR MENINGITIS—DEATH.

CASE VI.—D. J., aged about fifteen years; middle-grade imbecile; undersized, awkward, and ungainly in appearance; very nervous; articulation imperfect; speech thick; myopia; staggered when walked. When one month old had a series of spasms which continued at irregular intervals for six months, then ceased. Imbecility believed to have been congenital. Is the eldest of four children—one brother and two sisters—all living and vigorous, both mentally and physically. Father aged fifty-three, mother forty-one, at time of J.'s birth. Labor ordinary; slightly deficient animation when first born.

December 17, 1882.—Had been feeling unwell for several days. Complained of pain in stomach, head,

and knee; feverish. Gave 1 gtt. tinct. aconite rad. in water every hour. Milk diet.

December 19.—Tongue slightly coated; sordes on teeth; no appetite. Two semi-fluid movements from bowels during the day. Temperature 100.3°, pulse 76. Prescribed 20 minims of hydrobromic acid in water *ter in die*. Stop aconite.

December 20.—Very little change; temperature 99°, pulse 68.

December 21.—Complained very much of pain in head. Lay in a stupor most of the day; exhibited symptoms of tubercular meningitis, and that diagnosis was made. Bowels moved voluntarily, kidneys acted properly. Continued hydrobromic acid, and in addition gave tinct. cinchon. comp. and sherry wine ää f 3 j three times daily.

December 22.—Temperature 100°, pulse 72; dysorexia.

December 23.—Was delirious. Slightly constipated. Administered enema at 8 P. M., but with no result. Ordered 30 grains bromide of potassium, and 15 grains of chloral dissolved in water, at 10 P. M.; also milk punch and beef-tea at intervals during the night. Temperature 101°, pulse 80. During temporary absence of nurse got up out of bed and walked about the room.

December 24.—Temperature 101°, pulse 76; respiration 36; heart impulse felt slightly to right of sternum; abdomen retracted; pupils normal; eyes

slightly congested; ceased talking, and would not respond to questionings.

December 25.—Some strabismus; face congested; semi-comatose; fæces and urine passed involuntarily; temperature 100°, pulse 80; respiration 30. Substitute 10 grains sod. brom., and 5 grains ammon. brom., three times a day, for hydrobromic acid. Continue tinct. cinchon. comp. and sherry wine.

December 26.—Pupils unequal—left more dilated than right; less stupid, but responded to tickling and pinching; the *tache méningitique* of Trousseau was visible. Bowels moved twice; temperature 103°, pulse 90; respiration 32.

December 27.—Failed rapidly after 12 P.M. Two convulsions during the night, and one of unusual severity preceding death, which occurred at 11:40 A.M. Right side of face paralyzed and much drawn; no autopsy.

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